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INTRODUCTION

This is a serial publication containing selected translations on all categories of economic subjects and on geography. This report contains translations on subjects listed in the table of contents below. The translations are arranged alphabetically by country.

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## POLAND

### Long-Range Plans Concerning the Modernization of the Paper Industry

[This is a translation of an article by Engrs. Josef Gajewski and Mieczyslaw Pachocinski, in Przegląd Papierniczy, No 11-12, November-December 1959, Lodz, pages 342-345; CSO: 3789-N]

The long-range plan worked out for our industry assumes, by 1975, at least a two-fold rise in paper consumption as compared to the present. This means that our production must double from now until 1975.

Not only new machines but the full utilization of the presently owned machine inventory must contribute toward the doubling of production--namely:

- 1) obtaining the full productive capacity of the new machines
- 2) standardization of machines
- 3) a reduction in machine idle time
- 4) modernization of machines

The authors of the long-range plan of 1960-1975 for the cellulose-paper industry described this rise as follows: "by achieving full productive capacity of the machines a production increase of 28,900 tons of paper and 3,200 tons of cardboard will be obtained, and through the standardization of the machines the production increase will amount to 5,700 tons of paper and 300 tons of cardboard."

What remains to be done is to calculate the production effects of reduced machine idle time and of modernization.

### Increasing the Utilization Degree of Production Machines

The basic concept of major repairs in our industry should pertain, in the future, to power, water, transport, installations, buildings, etc.

Machines and production installations should be repaired and preserved by a planned preventive repair system. On the other hand, each machine should be thoroughly overhauled and eventually modernized every eight to ten years.

The percentual utilization of production machines in 1958 amounted on the average for

paper machines	85.8 percent
cardboard machines	87.0 percent

of the nominal time--that is, the calendar hours reduced by the six legal holidays.

The degree of utilization of the machines can be raised by switching to a planned preventive repair system, which in our industry is based on a 48-hour repair stoppage every month.

This system is characterized by a reduction in stoppages with respect to each repair that lasts over 13 days, and it is known that the repair of some machines takes three and four weeks every year.

The 48-hour stoppages amount to 6.7 percent in relation to nominal hours. Adding to this technical stoppages of 5 percent (for example, in 1958 the technical stoppages for paper as well as cardboard machines amounted to 4.8 percent), we will obtain a maximum utilization level of:

$$100 - (6.7 + 5) = 88.3 \text{ percent}$$

The gradually introduced system of planned preventive repairs, started in our industry in 1955, includes annually a greater number of machines. Thus, for example, in 1958 34 paper machines and two cardboard machines, which together produce 57.2 percent of the paper and 21 percent of the cardboard, were already included in this system.

An additional 33 paper and six cardboard machines should be switched in the future to the planned preventive repair system. A combined total of 75 machines producing 92 percent of the paper and 59.5 percent of the cardboard would be included in this system of repairs (the remaining 25 machines will never have the conditions for switching to the discussed repair system).

The resulting production increase compared to the production of the current year may amount to about 5,500 tons of paper and 1,000 tons of cardboard.

The gradual switch to this system of additional machines in subsequent years is dependent upon investments, mainly investments in power, for example those in:

Kalety, upon the construction of a fourth coal boiler  
Malta, upon the construction of a third boiler  
Mlynowa, upon the construction of a fourth boiler and  
straightening out of the power management  
Janowice, linking the factory to the regional power network, and so on.

The further maintenance of this kind of production machine repairs and the switching of additional machines to this system is conditioned by the availability in the factories of a power reserve and a proper shop inventory.

This system assures the proper preservation of machines, permits independence of outside contractors, and alleviates supply difficulties.

Generally, a higher degree of machine utilization will be achieved if the following additional conditions are fulfilled:

- 1) an increase in work discipline and a rise in the feeling of responsibility on the part of the crews;
- 2) a richer supply of replacement parts of better quality, and spare mechanisms such as motors, pumps, gears, various shafts, and so on;
- 3) an improvement in the organizational state of the factory shops (more qualified management) and renewal of the lathe inventory;
- 4) increased responsibility in the production division for the technical state of the machines.

### Machine Modernization

The Main Division for the Mechanization of the Paper and Cellulose Industry Plants, in carrying out a program of bringing the machine inventory to the proper technical state, has singled out for modernization in the next years, 33 paper

machines and four cardboard machines, determined the scope of modernization and production effects for an additional 20 paper machines and one cardboard machine.

The combined production of these 21 machines amounts to about 120,000 tons per year. The expected increase due to the modernization, was calculated at an average of 20 percent of the starting capacity of each machine.

Assuming, by analogy, that the remaining 16 machines (including three cardboard machines), whose combined production amounts to about 60,000 tons of paper and 15,000 tons of cardboard per year, will achieve the same percentual increase as the machines previously mentioned, we will then obtain inclusively, through the modernization of 37 machines, an increase of 34,000 tons of paper and 5,000 tons of cardboard.

A list of the machines is given at the end of this article.

#### What Will Be the Assumed Cost of the Attempted Modernizations?

The authors of the long-range plan state that each ton of increase per annum due to modernization of a machine costs from 1,500 to 3,500 zlotys.

Even assuming the maximum cost, because of the need for a better supply of replacement parts and spare mechanisms in order to create conditions for quick exchanges of pumps, motors, gears and various shafts, the costs of the attempted modernization amount--at the calculated increase of 39,000 tons of paper and cardboard--to:

$3,500 \text{ zlotys} \times 39,000 \text{ tons} = 136 \text{ million zlotys}$

this means an average per machine of:

$136 \text{ million for } 37 \text{ machines} = 3.7 \text{ million zlotys}$

For comparison purposes, we quote the expenditures for new machines per installed ton:

In Skolwina,	7,600 zlotys
In Wloclawek,	6,300 zlotys
In Krapkowice,	5,200 zlotys

On the other hand, modernization costs us:

In Pabianice (Paper Machine II), 2,270 zlotys per ton of increase annually

In Czestochowa, 3,280 zlotys (in the second stage of modernization).

The attached figures are very convincing if we consider the merits of modernization, even omitting the fact that, unlike a new machine, a modernized machine does not require an increase in the service crew.

Each modernization provides an opportunity for improving the technical state of the entire machine and not only of the parts which are modernized.

#### The Basic Modernization Trends in Paper Machines

The goal in modernizing any machine is to increase its productive capacity and reduce the price of the product.

We must establish at the outset what we should understand by the term paper machine modernization.

This term describes the introduction of such changes in the machine construction which would permit either an increase in its productivity--that is, the production quantity per time unit--or an improvement in the quality of the manufactured products, or even the manufacture of new assortments. In these present considerations, we will deal with the effect of modernization on increasing productivity.

In analyzing the physical manufacturing conditions in a paper machine, it can be concluded that the easiest and greatest effects in increasing productivity can be achieved by reducing the moisture of the strip in the wet part of the machine. It must also be emphasized that increasing the productivity of the machines in this way simultaneously gives the additional effect of a considerable reduction in the price of the product, because in paper making the cost of drying is the highest of all processing costs.

The possibilities of utilizing the increased productivity of paper machines entails the need to increase their working

speed. This leads to the conclusion that the degree of rise in the productive capacity of any paper machine depends upon the speed that the machine was constructed for. We will discuss in turn the methods of reducing the moisture of the strip in the wet part of the machine. This part is composed of two separate sections--a screen and a press section. These parts will be discussed separately.

## I Screen

The degree of dehydration of the strip on the screen can be increased by:

- 1) Increasing the diameter of the rollers because rollers of larger diameters dehydrate the strip better.
- 2) Replacing several rollers in the beginning part of the screen with gathering fillets.
- 3) Installing deflectors behind the rollers in the beginning part of the screen in order to prevent moistening of the rollers (deflectors are used at higher screen speeds, starting from 150 meters per minute).
- 4) The consolidation of the suction boxes into one block (eventually two blocks in case they have to be used on an "Eguter" machine) and the installations of additional boxes in the obtained space. Since the strip is drier on such closely spaced boxes at lower subpressures than in the case of dispersed boxes, an additional effect will be obtained--namely, a reduction in the consumption of screens. Thus, there is a less frequent replacement of them, which in turn makes for shorter stoppages for the replacement of screens and in savings on their purchase.
- 5) The installation of suction boxes with a movable surface, of the rota-belt type, which allow the use of higher subpressures than stationary boxes, with a simultaneously reduced screen consumption.
- 6) The replacement of the over-aged piston pumps that provide the suction for the boxes, with modern rotary pumps that will provide a higher degree of strip dehydration at a uniform work rate and a reduced screen consumption.



7) Replacing the wringers with a suction roller, with which a much higher level of strip dehydration can be obtained, because in the case of suction rollers there is none of the strip crushing which occurs on a wringer at the same level of dehydration.

8) Extension of the screen. Such possibilities occur frequently in old machines equipped with drying sections too large compared to their screens.

## II. Presses

The dehydration of the strip on the presses can be increased by taking the following precautions:

1) An exchange of gripping mechanisms for more modern ones--for example, replacing the screw type with the crane type, which would give a uniform grip along the entire press.

2) Replacing cast-iron upper rollers with stone rollers, which would allow the use of greater gripping pressures.

3) Replacing the squeeze presses with suction rollers, with effects as in the case of the wringer.

4) Increasing the number of the presses.

5) Installing "Vicker" washers in order to avoid machine stoppages for the removal of the felts for washing.

6) Warming of the strip in order to decrease the stickiness of the water, thus facilitating its removal from the strip. The strip can be warmed in various ways and in various parts of the machine, as follows:

a) before being poured on the screen, which is costly and requires frequent washing of the machine because of slime formation at temperatures of around 40 degrees centigrade;

b) warming the strips on the last suction boxes by means of the passage of steam through the strip instead of air; this method is already being used in the USA and is known here only from the literature;

c) warming the strip before the last press on the drying cylinder; because of technical difficulties (the removal of the paper from the cylinder and guiding it),

such an installation can be used successfully only for thicker materials, such as cardboards and celluloids;  
d) heating of the strip before the last press with infrared rays. Attempts to use this method, carried out in Western Europe, gave good results.

### III. Dryer

Increased productivity in the dryer part of the paper machine can be achieved by:

- 1) increasing the number of drying cylinders ;
- 2) replacing the polishing cylinders with larger ones;
- 3) improving the work of the drying cylinders by supplying hot dry air for the removal of vapors;
- 4) hooding the dryer in order to intensify the removal of vapors;
- 5) improving the removal of condensates from the cylinders.

### IV. Driving Power

Increasing the productivity of a paper machine requires an increase in its speed and in its power needs. We must therefore establish whether the existing power drive will be sufficient for the new task or whether it also has to be modernized.

A great majority of our paper machines have over-aged power drives. These are either drives of alternating rotations in an arrangement parallel to the axis of the machine but with an open countershaft, frequently with unmilled cogwheels that cause vibrations of the machine ensembles; or in a perpendicular arrangement to the machine axis composed of a number of parallel shafts that transmit the power from section to section of the machine. Such an arrangement is inaccessible and dangerous to the crew, consumes a lot of power, and usually hinders or makes impossible the placement of condensation pots, which in turn hinders the control and mastery of the condensate outflow from the cylinders. Efforts must be made to replace such power drives with ones that are parallel to the machine axis and have sealed silent-running modern countershafts equipped with bevel gears.

We must also aim to replace the constant revolution drives with individual power drives.

## V. Water Management

A problem closely linked with machine modernization is the necessity of introducing the proper water management through the return of waters rich in fibers to the production process instead of directing them into the fiber removal tanks. Thus:

1) Water from breaks in the screen and screen overflows should be directed into the blending tanks.

2) The first-screen waters should be used for diluting the mass that goes onto the sander.

3) The viscous water (liquor) from the fiber removal tanks should be directed to the same place.

4) The fresh water used in spraying the screens, ledges, and so on should be replaced with cleared water from the batches.

5) Fiber-rich water should not be used to start the union-joints, in order to avoid destroying the fibers through repeated grinding.

## VI. Miscellaneous

Attention must be paid, during the modernization of a paper machine, to other problems not discussed yet. To these belong:

1) Cleaning of the slurry before it enters the machine. The flat sanders so far used are usually too small. There is usually not enough space for the installation of suitable larger ones. Necessity therefore compels us to use modern centrifugal ones, which sort better but use quite a bit of power and are also quite quickly used up. In order to avoid this last undesirable effect, we must strive to leave the flat sanders as a preliminary sorting step.

2) Over-aged and small ledges must be replaced with modern ones.

3) The over-aged and frequently too small shakers must also be replaced with modern ones.

4) Properly matched scrapers, with respect to material construction and placement, must be used.

5) A good solution must be found to the problem of hall ventilation, since it has a great effect on the quality and quantity of production, the preservation of equipment and buildings, and upon the working conditions.

6) Access of the crew to the machine must be facilitated, particularly in the section guiding the paper.

## VII. Auxiliary Machines

To these belong the machines that prepare the slurry and those that put the finish on the final product.

With respect to preparing the slurry, we usually encounter union joints in our modernized machines. After increasing the basic productivity of the production machine, the union joint inventory may be too meager and there is usually a lack of space for the addition of new union joints. The work of the union joints can be alleviated in such cases through the preliminary suspension of the fiber raw materials in hydro-pulping machines and the eventual finish-grinding of the slurry in cone friction mills.

With respect to finishing machines such as all types of rewinders, calendaring machines, and cutters, if the existing ones do not suffice for processing the increased production then we will have no choice but to replace these over-aged machines with modern high-velocity machines.

## VIII. Power

In increasing the productivity of production machines, the need usually arises for more power and steam, and thus appears the problem of intensifying the work of power installations. We will give here only the most general outlines of what to do with out power equipment, which is usually quite archaic.

1) Our industry provides the possibility of applying the so-called combined economy of steam power--that is obtaining a certain quantity of power from the steam before applying it for technical purposes. We must utilize these opportunities to the utmost, because the resulting fuel savings gives great economic benefits within the enterprise as well as within the general national economy.

2) Boilers must be modernized, their age and construction permitting, because this gives considerable savings.

3) We must retire as soon as possible all steam condensing motors and replace them with anticompression ones, or eventually with condensate releasing ones or even with electric motors powered from the regional electric networks.

4) When the need arises for putting up new boilers or steam engines, the highest possible pressures should be used, because these machines are more economical at high than at low pressures.

5) The losses of steam and heat should be reduced to a minimum by insulating the pipes and sealing all connections.

6) We must attempt to return as much condensate as possible to the boiler room.

7) We must aim to achieve the highest power coefficient of the electrical installations.

One of the problems which aids in the production of intensification of the work of paper machines is the introduction of automation in our industry.

The following factors should be considered in introducing automation:

1) the technical state of the machine on which the regulators will be installed--thus the construction age of machine, etc.;

2) the produced paper assortments;

3) the possibility of creating in the factory the proper conditions for the installed apparatus.

With respect to the paper machines, it would be necessary to assure the regulation of the slurry concentration in the section where it is being prepared as well as the slurry level and composition in the vats, the hydrogen ion concentration in the water coming off the screen (pH), the paper strip weight per unit, the steam pressure supplied to the cylinders, and the moisture content of the paper strip.

Thus the following units must be employed in equipping one machine:

- 1) slurry concentration regulators
- 2) slurry quantity regulators
- 3) steam pressure (and dryness) regulators
- 4) pH-measuring
- 5) instruments that would control the paper strip weight per unit
- 6) a regulator of the moisture in the paper strip
- 7) a device for checking the temperature of the cylinder surfaces

Of the 81 paper machines that our industry owns, only 26 qualify for automation. However, a part of these machines already have some of the instruments.

It would also be advisable to consider the installation of slurry centers for the larger high-velocity machines, such as the fifth one in Myszkow and the third one in Rudawa.

The installation of slurry centers is undissolubly linked to a change in the method of preparing the slurry from a batch to a continuous process method.

In talking about the modernization of machines in the paper industry, it is impossible to omit the problem of plastics. Plastics can and should play a large part because of the specificity of our industry that works in corrosive surroundings. The reasons are many, such as the shortage and high price of colored metals as compared to the low price of plastics, their low specific weight and ease of processing. For sure, many elements of machines and equipment as well as conduits and armatures that are now being made from colored metals or steel can be made from plastics. The modernization of machines provide a particular opportunity for this.

According to the data of the slurry supply section of the Cellulose and Paper Industry Association, the needs of the paper industry for colored metals, alloys, and pure steels runs to an average of 500 to 600 tons per year. Of the above amount, two thirds is in the form of colored metals and alloys and one third in the form of pure steel. In the colored metal division, the greatest quantities are in the form of lead, copper, bronze, brass, and bearing alloys. According to calculating estimates, a rational use of domestically available plastics would permit a reduction in the needs for colored metals and fine steels of the paper industry during this year by at least 100 tons, and as our plastics industry expands, this coefficient should rise correspondingly.

It must be assumed that in the future, the mutual price relation of metal and plastic goods will shift more and more in favor of the latter, and this should create even stronger incentives for their wide use.

### How Should Modernization Be Carried Out?

The following phases must be completed:

1. Inception of the idea
2. Working out of the documentation
3. Carrying out of the modernization
4. Accepting the job and establishing the production capacity of the machine per unit of time.

1) Modernization ideas should be advanced by the factories; eventually with the cooperation of experts. The advanced idea should be supported by a technico-economic analysis.

The technico-economic analysis should not only consider the production ensemble but include all related production links, such as auxiliary and power.

2) The construction documentation should be worked out on the basis of the technico-economic analysis, based on domestic or foreign deliveries. This documentation should be worked out by a specialized office. This documentation should also include a work organization diagram, with particular consideration of those jobs which can and should be done before stopping the machine for modernization.

3) The design office mentioned in Item 2 should be responsible for:

- 1) completing the documentation in time;
- 2) working out the latter with consideration of the actual state of technical progress and the reality of achievements in this field;
- 3) selecting the best suppliers;
- 4) recommending the most suitable equipment and installations in the given case;
- 5) exact, honest, and real cost estimates.

The chief engineer of the enterprise carries some responsibility for the entire modernization. Being thus coresponsible with the design office, he must attend to the detailed evaluation of the documentation received, either by the appropriate bodies or by hired experts.

At the same time, having the responsibility for carrying out the modernization, he must:

- 1) select good contractors and suppliers;
- 2) see to it that jobs are carried out on time and that the entire unit is delivered for exploitation at the agreed time; the completed work should not deviate principally from the costs calculated in the economic analysis.

The obtained economic and production benefits foreseen in the modernization goals will serve to evaluate the worth of the above mentioned bodies.

4) The unit should be accepted, after modernization, by an acceptance commission created by the users. The commission would check the agreement between the documentation and the contracting work, as well as the production output of the unit after modernization, and eventually recommend improvements or innovations.

MP [paper machine] II was modernized in 1957 in Pabianice, and an MP was modernized in 1958 in Czestochowa.

The following observations, of an organizational nature, were made in the course of these modernizations:

1) Where the projects are carried out by various branch offices, it is imperative to maintain precise links between particular projects in order to avoid failures, misunderstandings, and confusion in the course of modernization.

2) The complete documentation should be given to the particular contractors at least two to three months in advance for examination. A mutual conference of the main designer, all contractors, the general contractor, and subcontractors, as well as the supervision should be organized in the factory one month before starting the work, in order to remove errors, doubts, and confusion in the documentation.

3) The general contractor should have knowledge and experience in paper industry modernizations or repairs.



4) The main designer and supervisory inspectors should always be on the construction site so that they can immediately render decisions, remove difficulties, and give explanations.

5) A detailed inventory of the parts to be built in should be taken before the modernization is started. All parts and equipment should be in the place and should be checked.

6) Because a considerable amount of repair work is usually done during modernization, it absorbs the (at best insufficient) average factory supervision; we should therefore strive to secure for the modernization work sufficient supervision by the contractors, with a relatively small participation of factory workers.

The full factory personnel should participate principally during the tests, starting, and accepting of the completed work.

We give below a list of the [37] modernization goals pertaining to paper machines.

#### Modernization Goals for 1959-1975

1959	Myszkow MP II
1960	Czulow MP III
	Czulow MP VI
	Czestochowa MP
	Mikolow MP I
	Pabianice MP I
	Jeziorna MP I
1961	Bydgoszcz MP III
	Jeziorna MP IV
	Czulow MP II
	Lomnica
	Tarnowka--cardboard machine
	Rudawa MP III
	Raszyna MP I
	Raszyna MP II
	Myszkow MP V
1962	Wloclawek MP V
	Wloclawek MP IV
	Janowice MP III
	Malta MP I

1963 Boruszowice  
Kolonsowska--cardboard machine  
Bydgoszcz MP I  
Krapkowice MP I  
1964 Kalety MP III  
Kalety MP IV  
After  
1965 Glucholazy MP I  
Glucholazy MP II  
Piechowice--cardboard machine  
Rudawa MP I  
Milkow--cardboard machine  
Karpacz MP I  
Dabrowica MP I  
Klucze MP I  
Klucze MP II  
Klucze MP III  
Myszkow MP IV

POLAND

The Most Efficient Use of Raw Materials  
in the Cellulose-Paper Industry

[This is a translation of an article by Magister  
Teresa Gorska, przegląd Papierniczy, No 11-12,  
November-December 1959, Lodz, pages 354-357;  
CSO: 3789-N/b]

Introduction

In all considerations involving the proper development of the cellulose-paper industry in Poland, the raw material usage emerges as a fundamental problem. The aim is to find a solution which would allow the most rational utilization of all means, permitting the most frugal management with respect to our domestic wood raw material base, and helping to advance the expansion and production growth of the cellulose-paper industry.

In the circles of our colleagues, the foresters, it has been stubbornly maintained that the cellulose-paper industry has a careless and passive attitude toward the state of our forests. This opinion, as far as we know, was also expressed at the 59th meeting of the Polish Forestry Society (Polskie Towarzystwo Lesne) held at the end of September in Kazimierz at the Wisla. At this meeting the representative of our industry talked of the breakthrough accomplished with respect to timber raw material savings in general, and about the processing of raw materials which replace the typical fir and pine pulp of classes I and II in particular.

In order to confirm the correctness of this opinion, we will here analyze the aims and achievements of the cellulose-paper industry in the field of saving timber raw materials. What we are interested in proving is that the paper industry understands the scope of the problem and, wherever and whenever possible, tries to use substitute raw materials.

In order to avoid the reproach that all this is mere talk, we will base our remarks not only on the planned goals but upon much more convincing things--namely, the already realized measures.

It seems that the given facts and figures may help the paper makers in the discussions which will yet go on on this topic with the foresters and will serve our industry well in establishing that we do not close our eyes to reality but try as much as possible to adapt to it.

The thesis which we propose and try to defend is as follows: the paper industry, understanding the duties which the state of the domestic timber raw material base puts upon it, strives to save and reduce the consumption of classical timber raw material.

The roads leading to this goal are the following:

- 1) increasing the share of old paper in the total quantity of fiber raw materials used;
- 2) increasing the consumption of timber offal and deciduous wood;
- 3) the introduction into production and consumption of highly productive and semi-chemical cellulose slurries in place of the typical slurries now used;
- 4) the reduction of the timber unit consumption coefficient by increasing the output per cubic meter of timber, through improving the technical processes and introducing new production methods;
- 5) limiting raw material losses.

We will now examine the results and goals in particular work sections, aiming at saving raw materials.

#### 1. Increasing the Share of Old Paper

Table 1 depicts the progress in the use of old paper, from 1950 to the estimates assumed in the long-range plan.

Table 1  
Consumption of Old Paper in the Paper Industry

Years	Consumption of Old Paper in 1,000 Tons	Unit Co-efficient of Old Paper Consumption in Kilograms per Ton of Paper and Cardboard Produced	Percent of Old Paper Collected*
1950	58.0	169	18.1
1951	76.5	192	22.2
1952	87.6	212	22.1
1953	101.9	239	24.6
1954	105.6	240	24.9
1955	117.7	245	27.1
1956	123.5	246	25.9
1957	132.6	257	26.3
1958	136.2	250	26.5
Expected			
1959	145.0	251	26.7
Planned			
1960	151.6	250	26.4
1961	165.0	253	27.0
1962	178.0	257	27.3
1963	200.0	266	28.9
1964	215.0	270	28.9
1965	238.0	284	29.8

\*The percent collected was calculated in relation to the paper and cardboard production of the year proceeding the year of consumption.

The collection of old paper in the Western countries, where the production and paper consumption per capita is considerably higher, reaches 35 percent. For example, the collection of old paper in West Germany amounted to 32.6 percent in 1957, with a paper and cardboard production three-fold higher than our planned production for 1965 (2). The paper consumption in West Germany amounts to 60 kilograms per inhabitant. The greatest degree of old paper collecting is noted in Holland, where it amounts on the average to 35 percent, with a paper

consumption of 64 kilograms per inhabitant (1). In our country, the paper consumption does not exceed 19 kilograms per inhabitant.

As it appears from the data given in Table 1, the use of old paper in Poland has increased since 1950 by 82 kilograms per unit of paper and cardboard produced. In absolute numbers, the use of old paper in the current year has increased by 150 percent with respect to 1950, whereas the paper and cardboard production for the same period increased by 68 percent.

Increasing the use of old paper, which is achieved through various technical and organizational moves (introducing formula changes that foresee an increased use of old paper; preparing the factories for increased processing; increasing the grinding capacities; eventually giving awards for increased processing and the like) is, however, limited by various factors, of which the most important are:

- 1) the supply of the proper grades of old paper;
- 2) a production assortment set-up which would permit the introduction of the largest quantity of old paper.

Because of these two factors, the unit consumption of old paper for paper and cardboard remains more or less on the same level during 1958-1961. Even if the quantitative production rise in these years were to foresee an increase in the old paper and cardboard, there would be no possibility of covering fully the needs of our industry for old paper by the Central Office for Raw Material Re-Use (Centrala Surowcow Wtornych). Thus the paper industry considers the actual possibilities of old paper delivery by the Central Office for Raw Materials Re-Use, whose collections do not yet reach 27 percent of the paper and cardboard produced in the country. The new foreseen further increase in the use of old paper, reached 284 kilograms per ton of paper and cardboard in 1965, is being discussed and worked out with the Central Office for Raw Material Re-Use, which promises to deliver these quantities to our industry, thus achieving an old paper collection coefficient of up to 30 percent.

This increase is also made possible by the start of new units, which somewhat change the production profile of the paper industry. They tend to increase the production of cardboard and paper board cartons, into which the greatest quantity of old paper can and should be introduced. The present

production state of cardboard and cartons, the greatest and best receivers of old paper, is very unfavorable. Cardboard and cartons comprise about 20 percent of our total production, wherein the share of cardboard and paper board cartons containing old paper is very small. A rise of 70,000 tons in the production of paper board cartons and cardboard will occur in 1965. On the average, about 60 percent old paper can be introduced into this production.

It is worth mentioning that in West Germany, where old paper amounts to about 36.2 percent of the total fiber raw material consumed (2), cardboard and cartons comprise close to 26 percent of the total production in 1958, whereby about 70 percent of the total quantity of old paper was utilized for cardboards and cartons. This shows once again that with the present production structure, making use of limited means, without any increase in the assortment set-up, the paper industry made undisputable progress in the field of old paper use.

## 2. Increasing the Use of Deciduous Wood and Timber Offal

Turning now to the question of replacing typical pulpwood with substitute wood raw materials--that is, with deciduous wood and timber offal, we must realize that before 1957, outside of a small addition of pine to the white millings, practically no substitute timber raw materials were processed in the industry. However, the increasing deficit of typical pulpwood and the necessity of importing it obliged the industry to utilize all available domestic raw materials that could replace typical pulpwood.

In the cellulose-paper industry we understand substitute timber raw materials to mean:

### 1) Instead of the typical fir and silver fir pulpwood:

- a) debarked and bleached fir and spruce edgings
- b) debarked and bleached pine edgings
- c) debarked and bleached silver fir and fir cords
- d) debarked and bleached pine pulpwood for paper
- e) debarked and bleached deciduous pulpwood
- f) debarked planks
- g) debarked spruce and fir beams
- h) third class pulpwood obtained from timber for firewood

2) Instead of typical pine pulpwood:

- a) debarked, unbleached pine edgings
- b) second and third class debarked, unbleached deciduous pulpwood
- c) second class debarked unbleached beechwood
- d) bark-covered pine beams

Table 2 shows how the processing of substitute raw materials proceeded since 1957, show it looks now, and what quantities are foreseen for processing in place of typical pulpwood, by the end of the Five-Year Plan.

In examining the above cited data, the following should be considered: the difficulties which the industry encounters in realizing the plan of processing substitute wood raw materials; what has already been done in this section; and what will make further progress possible.

The jobs connected with the processing of substitute wood raw materials can be divided into two kinds:

- 1) those of an investment nature;
- 2) and those falling into the field of technical and organizational problems.

The introduction of technical methods which would permit the use of greater quantities of substitute raw materials belong to the second group.

With respect to the investment jobs, the basic difficulty which appeared was a lack in the factories of any installations whatsoever for the processing of substitute raw materials, primarily of choppers for edgings. Efforts to import this equipment were thwarted because the Paper Machine Factory in Cieplie expressed its readiness to produce it. A prototype of a chopper produced in Cieplie started work in Klucze in 1958. The progress in the field of edging processing may be dated since that time. The same choppers, constructed in Cieplie, are installed in Krapkowice, where they now work in full production, and in Kostrzyn. The installation of a chopper for edgings in Kalety, where an unsuccessful prototype of an imported chopper is now working, is also foreseen as well as the installation of a chopper for bleached pine edgings in Wloclawek.



Table 2

Consumption of Substitute Raw Materials in the  
Cellulose-Paper Industry (in 1,000 m<sup>3</sup>)

## Substitute Materials in Production of Cellulose Pulpwood

	Unbleached Pine Edgings	Bleached Pine Edgings	Branches	Debarbed Fir Beams	Bark Covered Beams	Grade I wood	Grades II & III	Bleached Pop- lar & Aspen	Bleached Fir Edgings	Beech Pulp- wood	Sawdust, chips, blocks	Pulpwood from firwood	Bleached Pine	Deciduous	Beech	Total Substi- tute Material	Percent of Substitute Raw Material in Total	Consumed Wood
1957	10.6	0.2	22.9			39.0	29.0	9.0	19.7		0.3		53.4			107.0	6.9	
1958 - plan	59.0	8.0	30.0						29.0		1.5		50.7	5.0	2.5	253.7	15.2	
1958 - realized																		
1959 - plan	18.4	6.1	31.3	2.0		29.3	17.2	15.8	21.5		2.9		47.9	6.0	4.3	202.7	12.5	
1959 - realized	71.0	15.5	30.0			27.0	22.8	10.0	30.0		0.8		48.4	12.0	2.3	269.7	15.5	
6 months	25.0	4.3	9.4	4.5		14.6	13.6	8.7	13.5		1.2		20.4	3.5	1.7	122.4	14.4	
1960 - plan	105.0	15.0	30.0			33.0	50.0	10.5	30.0		1.2		49.0	13.0	4.0	340.7	18.1	
1965 - plan	215.0	25.0	50.0	40.0	110.0	50.0	45.0	20.0	30.0	23.0			52.0	35.0	5.0	768.0	28.5	

Note: Owing to lack of precise data, the processing of beechwood into cellulose was not included in the above listing. This is one of the leading investment problems, and it is foreseen that a cellulose factory based on beech pulpwood will be started by 1967. Its annual productive capacity will be around 50,000 tons, with an annual consumption of about 250,000 cubic meters of beech pulpwood.

It must be noted that the processing of fir edgings is limited by the supply possibilities, which do not exceed 30,000 cubic meters per year. The processing of pine edgings, on the other hand, has been limited mainly by the faulty performance of the unsuccessful type of chopper in Kalety.

The second problem of an investment nature is the matter of preparing the cellulose plant, pulpwood mill, and paper factory to remove various impurities and contaminants appearing in quite large amounts in substitute raw materials. Pulpwood from deciduous trees, and primarily edgings, contain large amounts of practically irremovable fiber, gnarls, and other impurities, whereby--particularly in the case of edgings--the ratio of the surface to the wood mass is very unfavorable and the share of contaminants is high. The use of wood offal and deciduous pulpwood thus requires the installation of various units for purifying the cellulose mass and in the future also the pulpwood. The construction of these installations goes very slowly since they are not being produced domestically, and connecting them with technical process frequently requires extended alternations in the production sections.

Of the jobs of a technical nature connected with the processing of substitute raw materials, we must mention the following most important ones:

- 1) Carrying out an investigation of the use of barked pine pulpwood in the production of bleached pulp; the maximum addition was set at about 20 percent.
- 2) The technique of using birch pulpwood in the manufacture of bleached sulfate pulp was worked out.
- 3) The technique of processing barked pine edgings was worked out. The permissible maximum was set at about 10 percent.
- 4) A method of using birch pulpwood in the manufacture of sulfate pulp was worked out. The permissible maximum was set at about 15 percent.
- 5) A method of using beech pulpwood in the manufacture of brown pulp was worked out.

It is worthwhile to note, at the end of these considerations, data pertaining to the processing of substitute wood raw materials in other countries. For example, in Austria, which is one of the leading countries in this field, the total annual wood consumption amounts to 2,900,000 cubic meters (for 1957), including:

560,000 cubic meters of edgings, or 19 percent of the total consumption;

Deciduous pulpwood amounting to 11.6 percent of the total consumption.

Together, the processing of substitute raw materials amounts to 30.6 percent of all the processed wood.

In our case the share of substitute wood raw materials, as expressed in the Five-Year Plan, approaches 28 percent, according to the quantities given in Table 2. However, it must be emphasized that the quantities assumed for processing in 1965 are based on present outlines and estimates of the Five-Year Plan. It seems that the difficult raw material state will require far-reaching activities in order to satisfy the latest tasks put to the industry. These depend mainly on a considerably increased processing of wood beams and the use of chippings and pulpwood from firewood. The difficulty of processing wood beams lies in the necessity of debarking them mechanically. Because the concepts connected with the question of mechanical debarking of wood beams is only now being worked out (primarily of wood beams that will replace bleached pulpwood), the industry failed to place this in its present plans. The quantities in the planned goals means that the share of substitute wood will increase to over 50 percent of the total consumption in 1965.

### 3. The Introduction into Production and the Use of New Slurries in Place of the Typical Ones

The next step of the cellulose-paper industry on the road toward a reduction in the use of wood is the introduction into production and use of high-output slurries, semichemical slurries, chemical pulp, straw cellulose, and straw semi-slurries. It is worthwhile to mention several figures:

The cellulose production increase, in relation to the 1959 plan amounts to:

in 1960, 26,500 tons, or 11 percent  
in 1965, 144,500 tons, or 60.6 percent

For pulp, it amounts to:

in 1960, 1,100 tons, or 0.7 percent  
in 1965, 22,800 tons, or 14.2 percent

However, this increase assumes a high share in the 1965 production of slurries which are not being used now, namely:

30,000 tons of high-output slurry  
6,000 tons of chemical pulp  
15,000 tons of semi-chemical slurry  
32,000 tons of straw cellulose (an increase from the present 3,000 tons)  
6,000 tons of straw semi-slurry (an increase from the present 2,000 tons)

If we compare the present share of cellulose and straw semi-slurry production, amounting to not quite 2 percent of the total cellulose production, with the share of the above-mentioned slurries in the production of 1965--close to 22 percent--we notice that this is an abundant source for reducing the use of wood. The consumption of pulpwood in the production of high-output and semi-chemical slurry is 20 to 30 percent lower than the consumption in normal pulp. It is also important that the semi-chemical slurry and the chemical pulp be produced from deciduous wood and wood offal.

#### 4. Reducing the Wood Unit Consumption Coefficients

In dealing next with the reduction of the wood unit consumption, we must indicate at the outset that the consumption of pulpwood for cellulose and paper pulp in our industry compares very favorably with the coefficients cited in the foreign literature. The consumption of pulpwood according to various sources is as follows (in cubic meters per ton):

For unbleached sulfate pulp	5.05 to 6.0 (3)
	5.04 to 5.44 (4)
	5.0 to 5.23 (5)
For bleached sulfate pulp	5.8 to 6.1 (3)
	6.0 to 6.2 (4)
	5.6 (8)

For viscose cellulose

6.2 to 6.8 (3)

6.3 to 6.5 (4)

For sulfate pulp\*

5.3 (3)

5.44 (7)

For bleached pulp

2.82 to 3.0 (4)

2.89 to 2.95 (5)

2.64 (7)

2.86 (8)

For brown pulp

3.14 to 3.4 (4)

3.36 (7)

3.48 (8)

\*Averages accepted in the literature depending upon the grades of the pulp slurry: hard--5.2 to 5.6; normal--5.6 to 5.8.

In Table 3 we give the wood unit consumption in our industry since 1954 and up to the 1965 estimates

Table 3

Wood Unit Consumption for Cellulose Slurries and Pulp

Pulpwood, cubic meters per ton	1954	1955	1956	1957	1958	First Half 1959	Plan 1960	1965
Unbleached cellulose slurry	5.26	5.17	5.15	5.08	5.15	5.14	5.16	5.0
Bleached cel- lulose slurry	5.63	5.50	5.56	5.56	5.65	5.61	5.61	5.6
Viscose cel- ulose slurry	6.91	6.3	6.43	6.37	6.38	6.30	6.35	6.3
Sulfate pulp slurry	5.41	5.37	5.42	5.51	5.54	5.40	5.46	5.25
Bleached pulp	2.8	2.77	2.77	2.75	2.72	2.73	2.73	3.7
Brown pulp	3.42	3.40	3.38	2.34	3.30	2.34	3.32	3.2

## 5. Limiting the Raw Material Losses

Another important task that the cellulose-paper industry undertook was reducing the raw material losses. This problem appears most vividly if we consider that each percent lost in the production of paper and cardboard amounts, at the present production, to almost 6,000 tons of net fiber raw material (calculated as absolutely dry and pure fiber). The raw material losses in the paper industry were very high and remained on the same level of a long period. The steps the industry took to improve this state were the following:

- a) reducing the losses in the waste waters;
- b) proper organization of raw material acceptance; proper accounting and checking of raw material received for production; proper accounting of raw materials among the production divisions in the trusts; moisture control, and the like.

The listing below indicates the great changes that occurred in the section of raw material losses since 1950.

<u>Years</u>	<u>Percent</u>
1950	6.5
1951	6.3
1952	6.2
1953	5.9
1954	5.8
1955	4.9
1956	4.1
1957	3.3
1958	3.1
1959 (foreseen)	3.0
1960 (planned)	2.0
1965 (planned)	2.5

It is impossible to end these considerations without adding that changes are made in the fiber composition of some grades of paper and cardboard with the thought of saving wood materials. These changes are in the direction of cutting the share of cellulose and substituting pulp in all cases where it does not worsen the product quality (for example, newsprint).

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## POLAND

### The Supply and Demand for Wall Materials in 1960

[This is a translation of an article by Magister Engr Jan Borowski in Biuletyn Instytutu Budownictwa Mieszkaniowego (Supplement to Miasto), Vol X, No 10, October 1959, Warsaw pages 1-5; CSO: 3769-N]

The Institute of Housing Construction (Instytut Budownictwa Mieszkaniowego) is conducting studies on the influence of regional conditions on housing construction. The influence of these conditions can be considered from many points of view, starting with the problems of raw material resources and the productive potential of local construction materials and ending with the problems of esthetics and culture in the utilization of apartments. All these problems exert a major or minor influence, often in opposite directions, on the formation of towns, settlements, and individual buildings.

These studies include an analysis of the supply and demand for wall materials in relation to local raw material resources. Underestimation of the regional factor in the central balancing of wall materials has led to excessive railroad hauls of large tonnage on the national scale. The lack of systematic study and analyses in this field creates serious difficulties in planning the development of production of these materials.

Undoubtedly, both the balancing and the planning of the development of production of construction materials should take into account the regional conditions of all consumers, because, for example, housing construction in towns uses in wall materials only about 48 percent of whole production. Thus, a comparison of the results of regional studies of all the main recipients will create foundations for a proper planning of the development of production and the use of wall materials.

The presently computed balances of wall materials, both wojewodztwo and central ones, do not yet have a sufficient scientific background to take fully into account the regional conditions of at least the main consumers. The balances now prepared are collective in both the "production" and the



"demand" columns. Thus, they give a general picture of the demand for wall materials on the national and wojewodztwo scale for all consumers.

Nevertheless, an analysis of these collective balances gives, on the one hand, an evaluation of the potential of production and on the other hand certain recommendations for the planners to differentiate in the individual regions the composition of materials used.

In the IBM<sup>1</sup>[Instytut Budownictwa Mieszkaniowego; Institute for Housing Construction] studies, the balance for 1960 was accepted for analysis according to the so-called second version. In this analysis a region was provisionally assumed to coincide with a region of state administration--that is, a wojewodztwo.

#### Raw Material Resources and Production of Wall Materials

Basically, Poland has rich raw material resources for the production of wall materials. Unfortunately, the geological and technological documentation of these resources lags seriously behind and a proper tabulation of resources for the individual wojewodztwos cannot be complete. Nevertheless, the general geological survey and partly technological one make it possible to discuss the raw material bases of individual wojewodztwos, including the existing productive potential.

##### A. Resources of Clays and the Production of Construction Ceramics

Deposits of ceramic clays occur throughout the country. The resources and the technological raw material values vary in individual wojewodztwos. With regard to the quantity of recorded deposits, the first place is taken by Katowice and Poznan Wojewodztwos. Table 1 presents the deposits recorded in 1958 and the planned production of ceramic wall units in 1960.

Table 1  
Deposits of Ceramic Clays

Wojewodztwo	Total	Recorded Deposits Documented	Production of Ceramic Clay According to WKPG* Millions of Wall Units	Theoretical Index of Production Relative to Quantity of Recorded Deposits, Millions of Wall Units Per Quantity of Deposits
Bialystok	34	7	84.5	2.5
Bydgoszcz	46	9	256.5	5.6
Gdansk	33	10	173	5.2
Katowice	126	7	598	4.7
Kielce	38	3	168.3	4.4
Koszalin	14	2	90.7	6.5
Krakow	56	5	277.7	4.9
Lublin	65	4	250	3.8
Lodz	79	3	966.2	4.6
Olsztyn	19	4	73	3.8
Opole	50	7	140.6	2.8
Poznan	112	6	423	3.8
Rzeszow	62	7	248	4.0
Szczecin	36	3	69	1.9
Warsaw, including City of Warsaw	70	15	381	5.5
Wroclaw	56	6	300	5.3
Zielona Gora	40	1	212	5.3
Total	937	99	4,111.3	4.4

\*[WKOG = Wojewodzka Komisha Planowania Gospodarczego;  
Wojewodztwo Commission of Economic Planning]

It follows from the above table that documented deposits constitute only 11 percent of the recorded ones on the national scale. This ratio is still worse in the individual wojewodztwos planning a considerable production of ceramic materials. Although the general investment policy of the construction materials industry does not, in principle, provide for the opening of new ceramic plants, documentation of the deposit is indispensable for the existing modernized

plants, first of all to switch production to the so-called hollowed elements (hollow brick, grill brick, etc.), which, in the present construction techniques, show definite superiority over the classical solid brick.

It seems that not only for the over-all production of ceramic wall materials, but also for the planning of the regional structure of production of all wall materials, it is indispensable to speed up the surveying of local raw material resources in the form of documentation of deposits. Unfortunately, deposits of ceramic clays constitute a clear (and not the sole) example of delays in work on this sector.

#### B. Resources of Construction Stone and Production of Stone Wall Materials

In construction practice we distinguish two types of stone wall materials--"light stone" and "heavy stone."

We accepted the definition of light stone as having a bulk weight of 1,200 to 1,800 kilograms per cubic meter,<sup>2</sup> which makes it possible to build from these stones outside walls of housing buildings with a thermal thickness equal to the thickness of walls of ceramic brick. Heavy stone, with a bulk weight above 1,800 kilograms per cubic meter, can be used for building walls not specially requiring thermal insulation (e.g., cellar walls, internal supporting walls). In this division we will examine the stone wall materials.

Light Stone: In this group of materials we include in Poland the layers of light limestones. The geological locations of occurrence are given in Figure 1. Unfortunately, the documentation of these deposits is very limited; only the specialist publications<sup>3</sup> discuss in part the known locations of exploitation of light limestones. The documentation of the Central Bureau of Geology (Centralny Urząd Geologii) gave only the region of one województwo, Kielce, in 1958. The data of the WKPG give certain estimated magnitudes for Bydgoszcz, Katowice, Kielce, and Łódź Województwos. It is characteristic that neither source gives Lublin Województwo, which, as is evident from the map, is well equipped with layers of light limestones exploited for a long time for the needs of regional construction and in which even the WKPG expects exploitation in 1960.

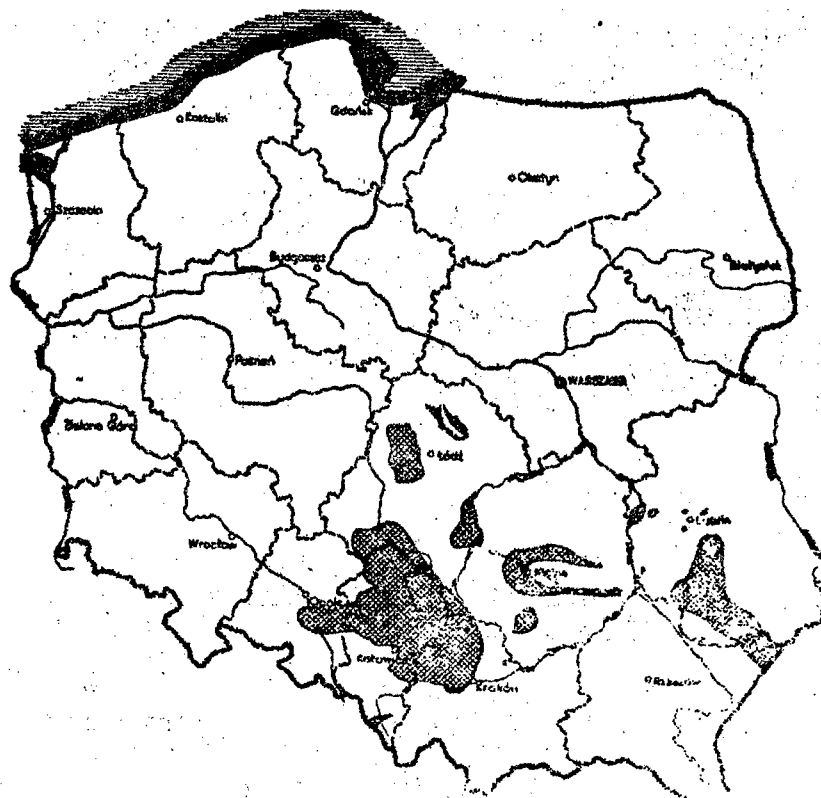


Figure 1

#### Geological Regions of Occurrence of Light Stone

The documentation of deposits, containing the findings of industrial usefulness of the raw material, should formulate a basis for starting production of light limestones, because in this type of material the geological distinction alone is insufficient, as is evidenced by the layers of light limestones in Kazimierz Dolny, where certain sections in the layers are usable while certain sections are completely disqualified as wall material. Table 2 gives data concerning the occurrence and production of light limestone in 1960.

Table 2

## Resources and Planned Production of Light Limestones

	Registered Resources in Million Cubic Meters	Production According to WKPG in 1960 in Million Wall Units
Wojewodztwo		
Bialystok	-	-
Bydgoszcz	152	-
Gdansk	-	-
Katowice	not counted	18.9
Kielce	not counted	8.8
Koszalin	-	-
Krakow	21	-
Lublin	-	17.7
Lodz	not counted	80.0
Olsztyn	-	-
Opole	151	14.4
Poznan	-	-
Rzeszow	11	0.97
Szczecin	-	-
Warsaw, including City of Warsaw	-	-
Wroclaw	-	-
Zielona Gora	-	-
Total	335	140.77

Remarks: According to the existing conversions from wall units into cubic meters of output (in millions)--0.35.

In connection with the transition in construction to industrialized methods, and particularly to monolithic construction, a serious deficit of aggregate is already emerging. It seems desirable to utilize the production of light-limestone as an aggregate for porous concretes, which in outside walls of housing buildings give greater effects than walls of broken stone and standardized blocks. Thus, the problem of light aggregates--not dealt with in this article--constitutes a very serious item in the light of the balance.

**Heavy Stone:** In this group of wall materials we have granites, syenite, porphyry, gray stone, sandstone, etc. mined from layers; there is also a second base of heavy stone in the form of so-called superimposed stone. Figure 2 gives the geological distribution of both of these raw material bases. As concerns superimposed stone, it is possible to limit ourselves to registering the regions of occurrence, but for exploitation from layers geological documentation is necessary. Since, however, the exploitation of heavy stone is first of all designed to supply engineering construction, and only a small percentage is destined for housing construction, the balancing of this type is approximate and the production in 1960 is planned in magnitudes given in Table 3.

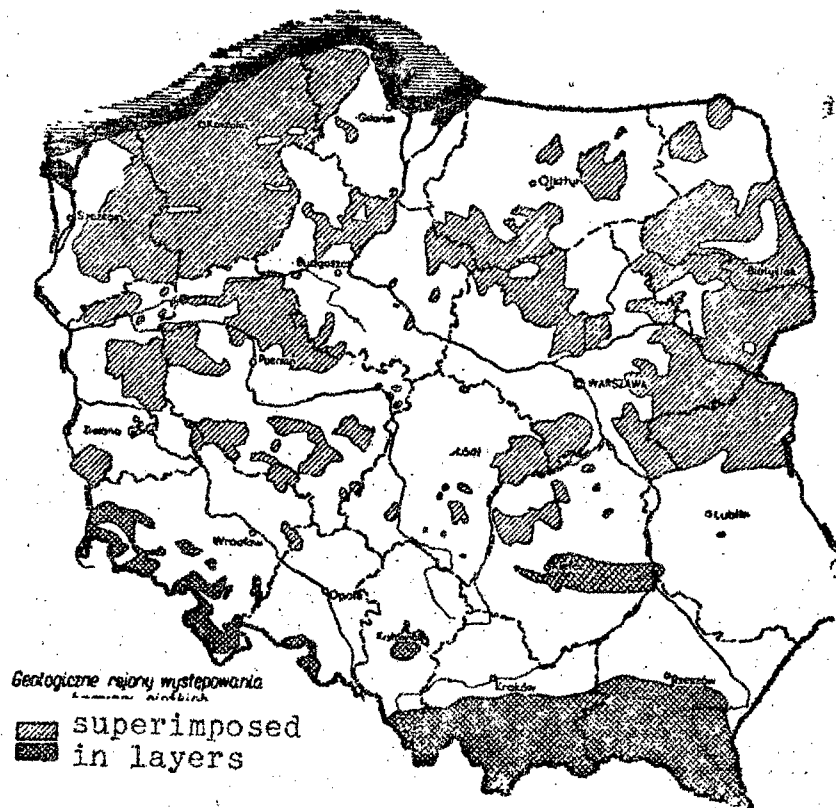


Figure 2

Geological Regions of Occurrence of Heavy Stone

Table 3

## Planned Production of Heavy Stone

	Production of Wall Materials from Heavy Stone in 1960	
	In Million Wall Units	In Million Cubic Meters
<u>Województwo</u>		
Gdansk	2.8	0.007
Kielce	115.7	0.289
Krakow	83.5	0.209
Rzeszow	1.4	0.003
Wroclaw	82.2	0.206
Total	285.6	0.714

The effectiveness of application of broken "heavy" stone in housing construction is limited to the regions of its direct occurrence, because of transport burdens and labor outlays, especially in comparison with foundations and cellar walls made of concrete. For this reason, this type of material should be directed primarily to surrounding rural construction without burdening state transport.

#### C. Resources of Natural Aggregates and Production of Wall Materials on This Basis

The problem of natural aggregates is even more complicated than that of heavy stone. Not only is its profile of application many-sided, but the composition is highly differentiated.

By natural aggregate we mean gravels, coarse sand, and sand. Figure 3 shows the geological regions of occurrence of all these types jointly. With rare exceptions, we do not have documentation of these deposits; only the individual locations of exploitation are known. The use of this raw material is rather differentiated even in wall materials.

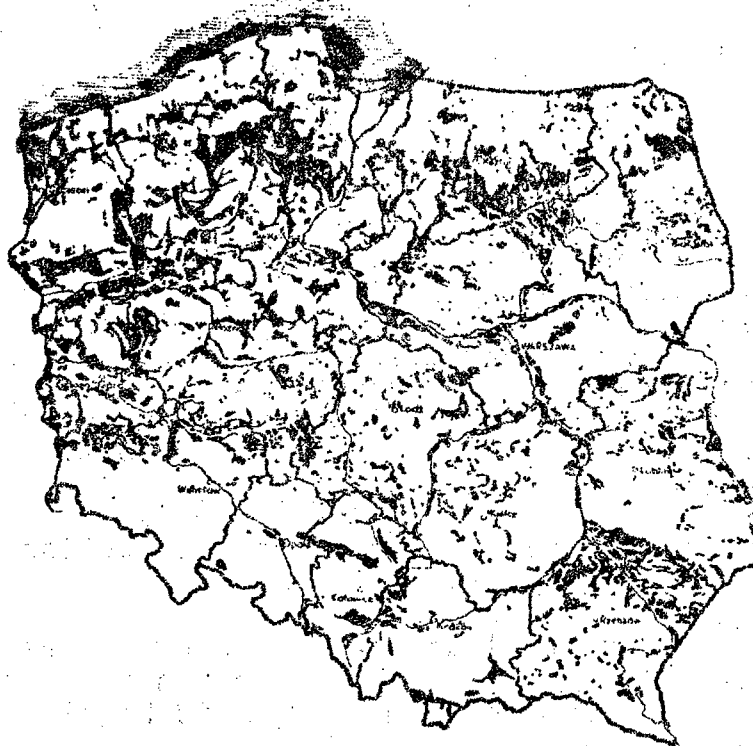


Figure 3

Geological Regions of Occurrence  
of Natural Aggregates

Thus, from sand we produce wall prefabricates of, for example, the "Zeran brick" type, and also silica bricks and some kinds of foam-concretes; monolithic and large-plate construction is partly based on gravels and coarse sand (pos-polka); thus it is difficult within the framework of one article to discuss all these problems. We will limit ourselves to a summary computation of registered resources and planned production. This is given in Table 4.



Table 4

## Resources and Planned Production of Natural Aggregates

	Registered Resources in Million Cubic Meters			Planned Production in 1960 in Million Cubic Meters	
	Sand	Coarse Sand	Gravel	Sand	Coarse Sand
Wojewodztwo					
Bialystok	10.3	21.0	65.5	no data	0.25
Bydgoszcz	0.8	9.7	no data	0.11	0.70
Gdansk	3.9	16.7	96.0	no data	0.14
Katowice	2.2	5.5	0.6	0.23	0.73
Kielce	10.7	6.2	3.0	0.11	0.02
Koszalin	0.8	6.0	15.0	0.04	0.09
Krakow	0.9	46.2	18.2	no data	0.70
Lublin	43.8	10.6	no data	0.16	0.09
Lodz	0.7	41.9	no data	0.19	0.01
Olsztyn	0.8	4.5	5.7	no data	0.09
Opole	3.4	52.4	18.7	0.06	no data
Poznan	1.0	6.4	no data	0.10	0.80
Rzeszow	1.6	2.9	0.3	0.31	0.23
Szczecin	0.9	5.0	11.1	0.23	0.31
Warsaw, including City of Warsaw	4.4	17.5	no data	0.08	2.07
Wroclaw	0.8	31.7	12.6	no data	no data
Zielona Gora	0.1	15.6	0.5	no data	no data
Total	87.1	299.8	247.2	1.62	6.23

The presented production data do not include the scattered small producers who supply an important amount of the production in this field.

As was already mentioned, several construction materials are produced on the basis of natural aggregates. The basic composition of these materials is to be produced in 1960 in quantities given in Table 5.

Table 5

Planned Production of Silica Brick  
and Wall Prefabricates

Wojewodztwo	Planned Production in 1960 in Million Wall Units	
	Silica Brick	Wall Prefab- ricates
Bialystok	12.5	26.0
Bydgoszcz	-	46.8
Gdansk	16.0	101.0
Katowice	-	294.0
Kielce	58.9	67.1
Koszalin	29.7	47.3
Krakow	24.0	65.4
Lublin	-	27.2
Lodz	1.5	175.6
Olsztyn	53.0	9.0
Opole	-	15.3
Poznan	20.0	53.0
Rzeszow	-	66.0
Szczecin	34.0	83.0
Warsaw, including City of Warsaw	56.0	138.0
Wroclaw	-	-
Zielona Gora	5.0	48.0
Total	310.6	1,278.7

While the production of silica brick is almost wholly in the state sector of industry, the planned production of prefabricates is broken down percentually among the following producers:

Ministry of Construction	47
Local industry	12
Various state producers	13
Cooperative movement	11
Private producers	17

The above table reveals the too small share of cooperative production, if only in comparison with private production in a field which does not require large investments and inaccessible equipment. Prefabricates based on scattered deposits of natural aggregate could be produced close to the construction sites, eliminating deficit rail hauls of large tonnage.

## Comparison of Demand and Production of Wall Materials

At this point it is necessary to stress that the magnitudes of both planned production and demand were determined in 1958 and since then some changes have occurred; however, for general considerations we can use the presented data, which in total quantities do not depart much from the original decisions.

There was also a certain difference between the central plans and the plans of the individual WKPG's. In this article we use basically the regional data. As a comparative illustration, Table 6 gives the balance of wall materials according to WKPG and central data.

Table 6

Comparison of the Planned Production and Demand  
for Wall Materials in 1960 for All Recipients  
(in million wall units)

Wojewodztwo	Total Demand for Wall Mate- rials	Production According to Assortment Plans of WKPG				Total
		Baked Brick	Silica Brick	Cell and Prefab- ricated Con- crete	Wall Stone	
1	2	3	4	5	6	7
1. Bialystok	200	84.5	12.5	26	-	123
2. Bydgoszcz	330	256.3	-	46.3	-	303.1
3. Gdansk	260	173	16	101	2.8	292.8
4. Katowice	1,100	598	-	294	18.9	910.9
5. Kielce	200	168.3	58.9	67.1	124.5	418.8
6. Koszalin	90	90.7	29.7	47.3	-	167.7
7. Krakow	570	277.7	24	65.4	83.5	450.6
8. Lublin	320	250	-	27.2	17.7	294.9
9. Lodz	515	366.2	1.5	175.6	80	623.3
10. Olsztyn	145	73	53	9	-	135
11. Opole	200	140.6	-	15.3	14.4	170.3
12. Poznan	410	423	20	53	-	496
13. Rzeszow	330	248	-	66	2.4	316.4

[table continued]

[Table 6 continued]

14. Szczecin	110	69	34	83	-	186
15. Warsaw, including City of Warsaw	760	381	56.0	138	-	575
16. Wrocław	250	300	-	16	82.2	398.2
17. Zielona Góra	100	212	5	48	-	265
18. Total	5,890	4,111.3	310.6	1,278.7	426.7	6,127.3

	Surpluses and Shortages According to WKPG Plan	Total Production According to Central Plan	Surpluses and Shortages According to Central Plan
1	8	9	10
1	- 177	147	- 53
2	- 26.9	427	+ 97
3	+ 32.8	234	+ 26
4	- 189.1	1,117	+ 17
5	+ 218.8	224	+ 24
6	+ 77.7	170	+ 80
7	- 119.4	599	+ 29
8	- 25.1	288	- 32
9	+ 108.3	573	+ 58
10	- 10	173	+ 28
11	- 29.7	281	+ 81
12	+ 86	553	+ 143
13	- 13.6	307	- 23
14	+ 76	115	+ 5
15	- 185	645	- 115
16	+ 148.2	302	+ 52
17	+ 165	210	+ 110
18	+ 237.3	6,365	+ 475

The absence of complete regional balances led to the emergence in the plans of shortages of wall materials in the województwos given in Table 7.

Table 7

## List of Wojewodztwos with Deficits of Wall Materials

According to  
WKPG Plans

Bialystok  
Bydgoszcz  
Katowice  
Krakow  
Lublin  
Olsztyn  
Opole  
Rzeszow  
Warsaw, including  
City of Warsaw

According to  
Central Plans

Bialystok  
-  
-  
-  
Lublin  
-  
-  
Rzeszow  
Warsaw, including  
City of Warsaw

Thus, the total balance according to WKPG tabulations has a surplus of 237.3 million wall units, and according to the central plan a surplus of 475 million wall units, which leads to inter-wojewodztwo hauls.

In this way it is possible to present formally the balance of wall materials for 1960. However, there is an aspect of this balancing which may change the results obtained. This will be illustrated by the example of housing construction: the demand in both central balances and in the WKPG is based on indices of consumption of wall materials prepared in 1948 (Instruction No 58 of the PKPG [Panstwowa Komisja Planowania Gospodarczego; State Commission for Economic Planning]). Thus, the index of consumption of wall units per cubic meter of housing accepted for balancing amounts to 72 wall units, on the assumption that all the supporting elements of the building are made of brick. However, since that time many changes and novelties have been introduced in construction technique, and in practice several elements are made of other materials, such as concrete, foam-concrete, silica brick, gypsum-concrete, etc. Thus, the total quantity of wall units per unit of space of the building will decrease as brick is replaced in the individual elements of the building by other materials proper for those elements.

On the assumption for the next few years that:

[a] 100 percent of the foundations will be made of concrete or stone;

[b] 25 percent of the cellar walls will be made of other materials;

[c] 30 percent of the dividing walls will be made of other materials;

[d] 30 percent of the external walls of the two upper floors will be made of other materials;

the attained index will be at a maximum level of 60 wall units per cubic meter of housing building.<sup>4</sup>

Apart from that, the balances for housing construction were prepared starting with the number of rooms planned for construction in 1960, multiplied by the conversion space of 100 cubic meters per room. This conversion is also inflated, because at present, with the lowered height of floors to 2.9 meters, this index should be 85 to 90 cubic meters per room.

Making a correction on this basis for housing construction alone, it will turn out that the total surpluses of wall materials will be 862.5 million wall units more in 1960-- that is, according to the WKPG tabulation  $237.3 + 862.5 = 1,099.8$  million wall units; and according to central tabulation,  $475 + 862.5 = 1,337.5$  million wall units.

Undoubtedly the correction of wojewodztwo balances will change the picture of deficits of wojewodztwos.

The problem of planning the production of wall materials still remains open in the individual wojewodztwos in such dimensions as to balance their own production on the basis of local raw materials with the needs of a wojewodztwo without transportation between distant wojewodztwos. But it is necessary to point out that, accepting administrative borders as borders of economic regions, we must remember that wojewodztwo balances cannot be kept within their borders because the economic and transport conditions may make it desirable to transport wall materials to the neighboring powiats of two neighboring wojewodztwos. Only the determination of construction regions, taking into account all the conditions of influence of the region, will permit the optimum utilization of the local raw material resources without undue burdening of transport, which, however, will undoubtedly influence the differentiation of the structure of buildings in the individual regions of the country.

At the present moment, however, it is most urgent to deal with the problem of aggregates of which the shortage may lead to nonexecution of the planned total of wall materials based on aggregates, which it turn may require an increase in production of other wall materials.

#### Footnotes

<sup>1</sup>Planning work entitled, "Contribution to the Problem of Demand for Wall Materials for Municipal Housing Construction," publication of IBM, Materialy i Dokumentacja, series B, Issue No 4/90/59.

<sup>2</sup>Concerning the maximum bulk weight of light stone, a controversy between stone experts has been going on for a long time; a maximum of 1,600 or even 2,000 kilograms per cubic meter is postulated.

<sup>3</sup>Engr St. Sunderland, on the order of the Bureau of Studies and Standard Projects of Industry Construction (Biuro Studjow i Projektow Typowych Budownictwa Przemyslowego), prepared this year records of known quarries of both light and heavy stone.

<sup>4</sup>See article by Engr Architect M. Grabczewska, "On the Method of Planning the Quantity of Wall Materials in Housing Construction," Biuletyn IBM, No 12, December 1958.

POLAND

The Main Combustion Marine Engines, Type RD

[This is a translation of an article by Engrs Josef Kryszewski and Andrej Presz in Budownictwo Okretowe, Vol V, No 1, January 1960, Warsaw, pages 8-13; CSO: 3793-N/a]

The growing need for engine power plants by Polish shipyards made the launching of the domestic production of combustion marine engines--main as well as auxiliary--indispensable. The major load of this production has been taken over by the presently expanding H. Cegielski Machine-Building Plants in Poznan, which will be in a position to supply the shipyards with main engines in the range of 2,500 to 24,000 horsepower. The ability to handle such capacities by various sized engines of HCP [H. Cegielski Poznan] production is shown in Figure 1. The H. Cegielski Plants mastered, in the first place, the production of Type RSAD76 engines licensed by the Sulzer Brothers, as well as Type D55 engines of Polish design. At present the plants are preparing, and in the near future will proceed with, the production of Type RD76 engines, constituting a perfected model which will replace the previously manufactured RSAD76 engines.

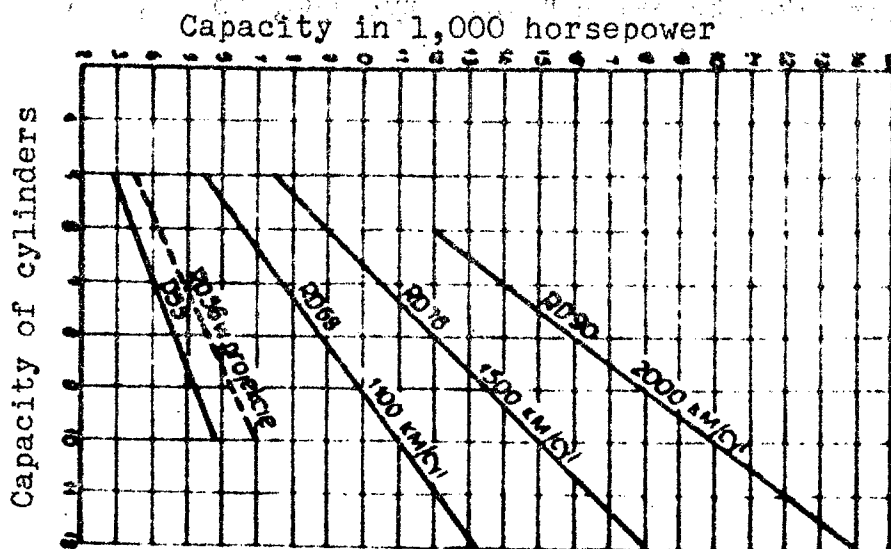
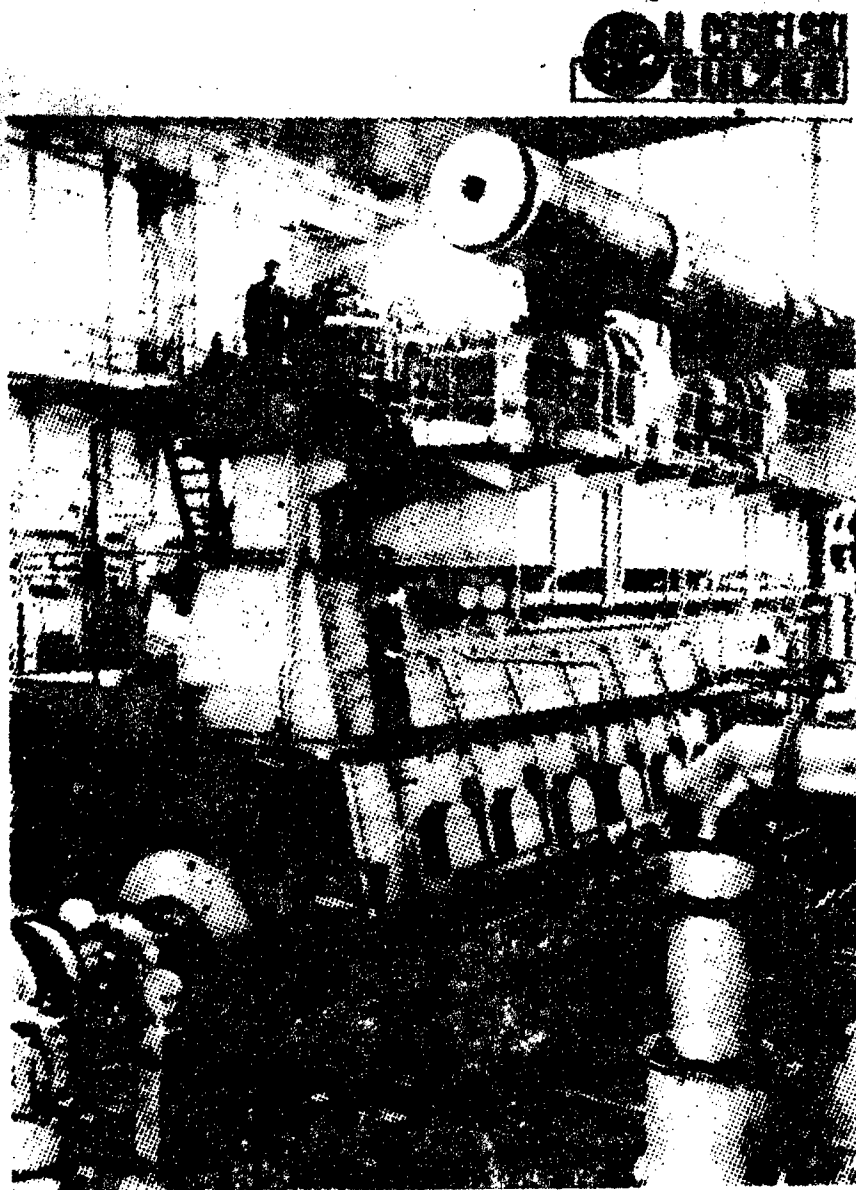


Figure 1. Principal Types of Marine Engines  
H. Cegielski Plants, Poznan

[KM/cyl = horsepower per cylinder]





First Type 6RD76 Engine at Its Testing Stand

The present requirements set by users and shipowners have considerably increased. In addition to the requirements with respect to high reliability in operation and a long service life, low price, great economy, light weight, and convenient servicing, concern for human comfort calls more and more for the reduction of the noise level and the limitation of vibrations.

The requirements regarding high reliability in operation and the desirable long service life compelled the manufacturers to limit the load on various engine components, while the requirements concerning the reduction of the weight and dimensions led to increasing the unit horsepower of the engine in a way which would not have a negative effect on the reliability and long service life of the engine. By limiting the speed of engines directly driving the screw propeller, only an increase in the unit horsepower obtained by boosting the engine, as well as a most economically worked out design, can secure the attainment of the desired goal with positive results for almost all requirements.

This road was followed by the Sulzer firm, which, on the basis of Type RSAD76 engines and other types previously produced, has created a new Type RD76 engine, and (subsequently) Types RD90, RD68, and RD56 engines of similar

design. Appreciating the necessity of further technical advance, as well as the advantages of the new engine type designed by the Sulzer firm, the H. Cegielski Plants proceeded with preparations for the production of Type RD76 engines, licensed by the Sulzer firm. As the demand of the shipbuilding industry grows, the plants will be in a position to supply the Polish shipyards with a full line of Type RD engines.

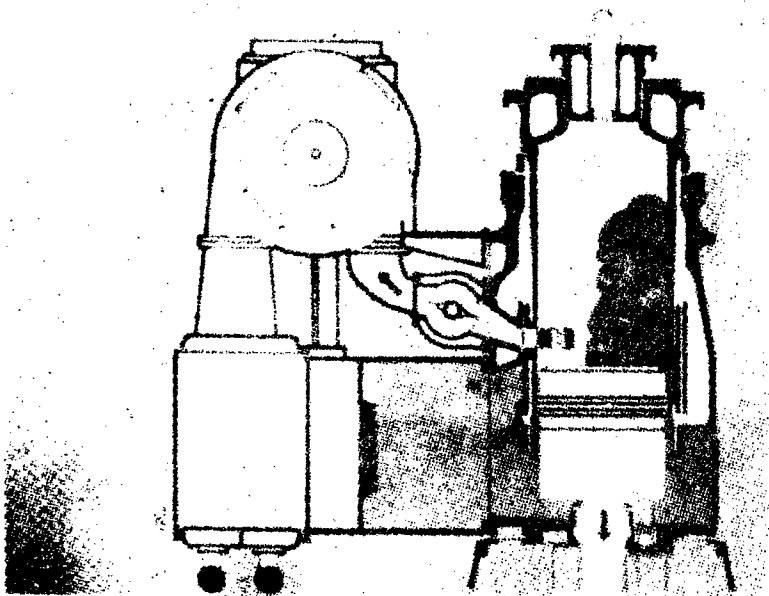


Figure 2. Exhaust and Initial Cylinder Scavenging Process

## General Description of Type RD Engines

Type RD engines are of the two-stroke, double-acting, cross-head, direct reversible type, designed for direct driving of the screw propeller. The Type RD engine is made only as an engine supercharged with the aid of turbo-blowers. The turbo-blowers supply the air passing through the coolers to the engine tank, and from there to the cylinder space below the pistons. When the piston moves downward (Figure 2), the air contained in the space below the piston is additionally compressed by reverse valves in the engine block. The moment the piston uncovers the scavenging gap, air of higher pressure enters the cylinder, preventing the combustion gases from back-flowing, and the oil coke from settling on the scavenging gaps. The pressure changes in the sub-piston space are shown in Figure 3.

atmos-  
pheres

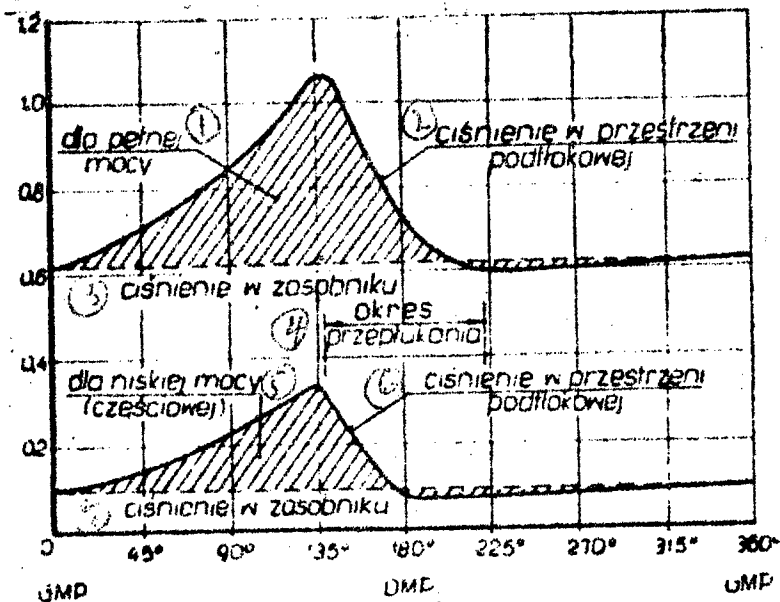


Figure 3. Tentative Pressure Cycle in Sub-Piston Space

- 1) for full capacity
  - 2) pressure in sub-piston space
  - 3) tank pressure
  - 4) scavenging period
  - 5) for low capacity (partial)
  - 6) pressure in sub-piston space
  - 7) tank pressure
- [GMP and DMP not identified]

The cylinder and sub-piston space is further filled by the blowpipe, through the automatically opening reverse valves (Figure 4).

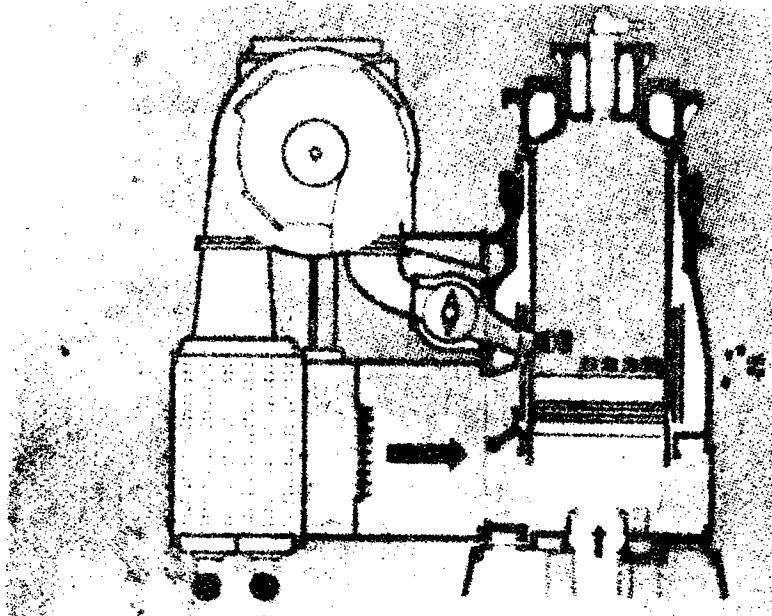


Figure 4. Scavenging and Supercharging Process of Cylinder

The above cooperation of the sub-piston spaces in the scavenging process facilitates the starting and control of the engine, supplying sufficient scavenger air to start and maintain smokeless operation of the engine until the turbo-blower develops and attains the speed required to render the supply of larger quantities of air possible. Moreover, the above system ensures the operation of the engine and the supply of sufficient power to drive the ship at a speed of 75 percent of its nominal speed if all the turbo-blowers should break down. The cooperation of the pistons in the scavenging process is made possible by the separation and sealing of the sub-piston spaces from the crankcase. At the same time this prevents the combustion remnants of heavy fuels from entering the crankcase and from rendering the lubricant impure. In this way the elements of the crankcase system are protected from the corrosive action of the sulfuric bonds, which occur in considerable amounts in the above-mentioned combustion remnants. The remnants of the cylinder oil and fuel which accumulate on the bottom of the sub-piston spaces are removed by a pipe system.

The height of the cylinders, and consequently of the entire engine, has been reduced owing to the application of short pistons. These pistons consist of two parts, whereby the upper part, the so-called piston bottom, is cooled with oil or water. The exhaust fumes from the cylinders are directed by additional rotary valves into the outlets. These valves close the sub-piston spaces when the pistons are above the outlet gaps. The passages between the respective outlets of the liner are cooled with water, with the purpose of preventing great temperature differences in the liner and the flushing and exhaust sides, and thus preventing dangerous distortions and tensions. The fire ring in the upper part of the liner also makes possible the combustion of heavy fuel.

The fuel pumps are mounted on the engine at half its height and at the center of the engine. It should be noted that the distribution shaft with fuel cams mounted on it runs along the engine at this height. The distribution shaft is driven by the crank shaft through a cog-wheel. This gear mechanism, including the chain gear of the outlet rotary valves, can be mounted--depending on the number of cylinders--at the center or end of the engine.

The engine is provided with a hydraulic regulator, which controls the fuel pumps according to the speed for which it is set. The engine is controlled through mechanical and pneumatic systems from the control post located at the front of the engine, or on its side.

Most of the heavy and large parts of the engine are of welded steel construction. The economical, but nevertheless compact, welded steel structure of such components as the engine base, stands, air tank, etc. will considerably reduce the weight of the engine. The cylinder block and liner, the lower parts of the pistons, and the heads are produced as casts of special tough cast-iron. Moreover, the cast-iron used for liners, lower piston parts, and piston rings are highly resistant to abrasion, thus ensuring a long service life.

## Basic Changes Introduced into the Design of Type RD Engines as Compared with Type RSAD 76 Engines

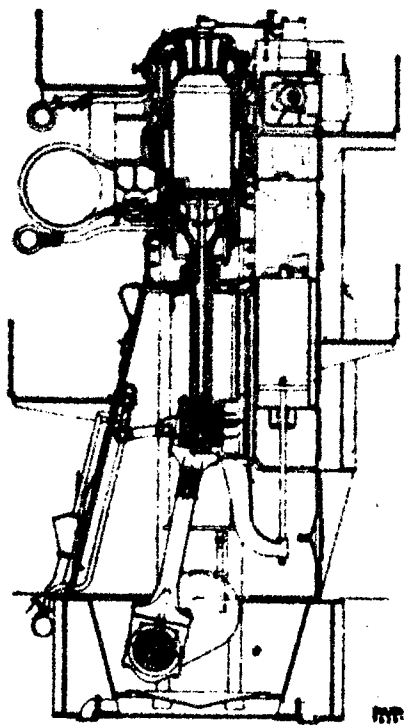
At present, the series of RD engines is represented by the RD76 type of engine, whose design was entirely completed by the Sulzer firm and put into serial production. The first Type RD76 six-cylinder engine was furnished to the Gdansk Shipyards.

The design of the Type RD76 engine is primarily based on the Type RSAD76 engine. A diagram of these engines as well as that of Type RS76 in a non-supercharged version, are shown in Figure 5. In spite of a number of changes in the design, their similarity is quite apparent. The most essential changes introduced into the Type RD76 engine, as compared with Type RSAD76, are the following:

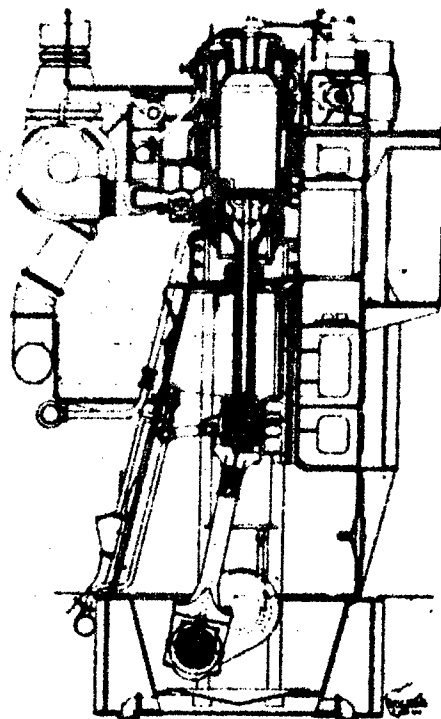
a) Change in the Design and Location of the Scavenger Air Tank: The air tank, which in the Type RSAD76 engine was located on the control side, constituted a design based on the scavenger piston pumps of the Type RS76 engine. As soon as it had been decided to construct Type RD engines only in the supercharged version employing turbo-blowers, it appeared expedient to transfer the air tanks to the closest vicinity of the turbo-blowers, in order to reduce the air pipe system. In the Type RD76 engine, the scavenger air tank, including the air coolers, was placed on the exhaust side. The turbo-blowers were mounted vertically directly above the tank. In connection with the transfer of the air tank on the other side of the engine, the shape of the cylinder block also underwent a certain change. This was due to the location of the air intake on the opposite side of the cylinder and the necessity of shifting the reverse valves of the exhaust up above the tank.

The supports, which in the case of Type RSAD engines are characterized by an asymmetrical shape with a bend beneath the tank, are entirely symmetrical in the case of RD engines, retaining the same inclination of the crankcase side walls.

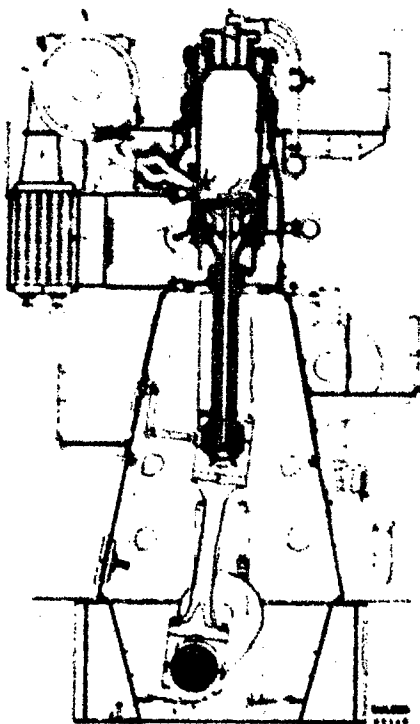
b) Change in the Location of the Distributor Shaft: The distributor shaft, which in the Type RSAD76 engine is mounted at the level of the heads, has been transferred to approximately half the motor height--that is, to a traditional location for marine engines. It was possible to do this because of the transfer of the air tank to the exhaust side of the



RS 76



RSA 76



RD 76

Figure 5

Cross-sections of Types  
RS76, RSAD76, and RD76  
Engines

engine, as well as owing to the new design of the gear mechanism for the exhaust reverse valves.

The lowering of the distributor shaft in turn permitted the change in its gear mechanism. The chain gear used in the Type RSAD engine on account of its great distance from the crankcase, could be replaced in the Type RD engines with cog-wheel gears. A diagram of that drive, including the chain gear of the exhaust reverse valves, is presented in Figure 6. The length of the distributor

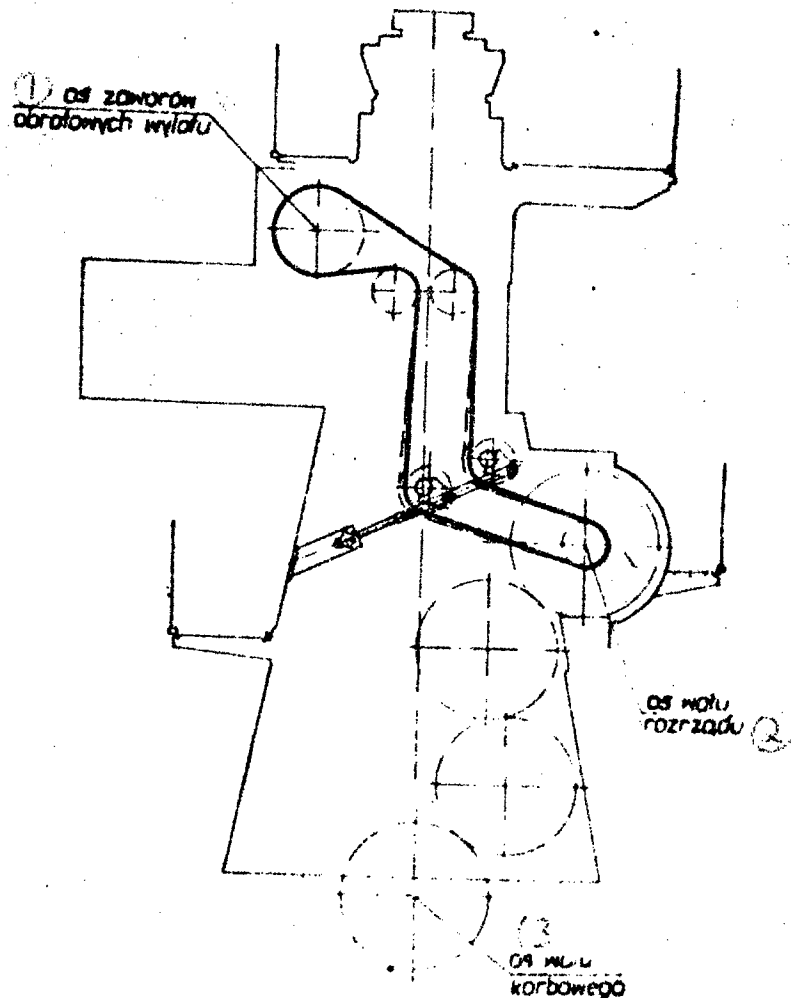


Figure 6. Gear Mechanism for Distributor Shaft and Exhaust Reverse Valves

- 1) exhaust reverse valves axle
- 2) distributor shaft axle
- 3) crankshaft axle



shaft has been reduced. It does not run through the entire length of the engine but only from the gear placed in the center or at the end of the engine to the grouped fuel pumps.

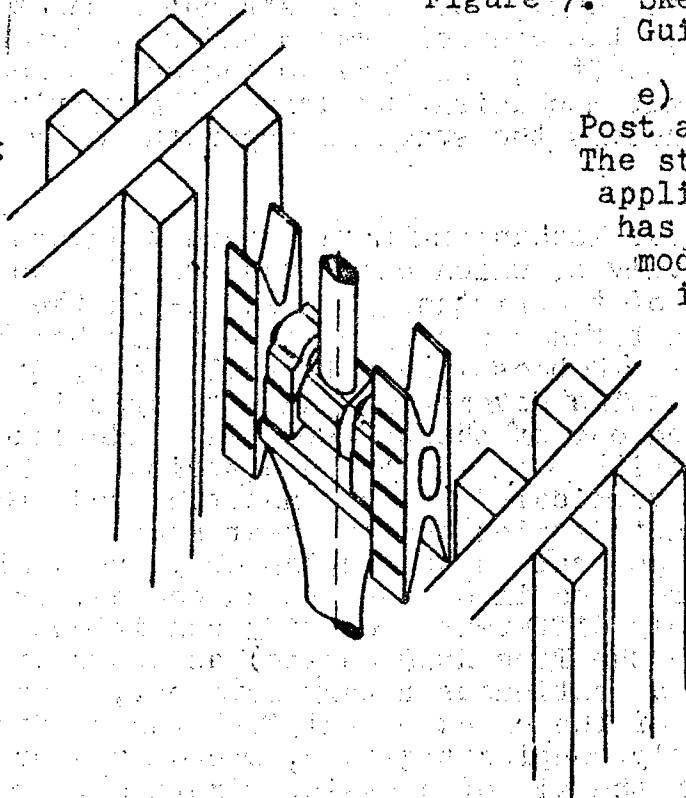
Another change in the design of the distributor shaft is the different design of the control system and starting mechanism. The distributor shaft of the Type RD engine has no cams for the steering of that mechanism but drives the vertical shaft, which in turn drives the starting apparatus of revised design.

c) Change in the Gear Mechanism for the Exhaust Reverse Valves: The reverse valves, which close the cylinder outlets at the upper position of the pistons, and which--in the case of short pistons--permit the compression of the air below the pistons as well as the boosting of the cylinders, performed an oscillating swing movement around its axis in the Type RSAD engine. Each one of these valves was independently actuated by the eccentrics located on the distributor shaft. Spring buffers in the vertical driving connecting rod protected the valve against jamming and the gear mechanism against failure. The general change in the drive mechanism for these valves, introduced into the Type RD engine, is connected with its entirely different operating conditions. The valves arranged (as in the Type RSAD engine) as a certain kind of gate, perform a continuous rotary movement, whose speed is half of that of the crank and distributor shafts. All the valves, properly coupled together, are driven by the distributor shaft with the aid of a chain (Figure 6). The flexible edges of the valves protect them against possible jamming caused by the penetration of impurities.

d) Change in the Design of the Guide System: The guide system in the Type RD engine has been designed in a completely different way than that for Type RSAD engines. The Type RSAD engines were equipped with flat guides run in individual guides mounted on the lower scavenger air tank as well as the bifurcated head of the connecting rod. In the Type RD engine, each of the crank mechanisms has two guides located on the adjacent supports. These guides are double-sided and carry one guide each. Both guides are mounted in a rotary manner on the elongated ends of the diagonal to which the piston rod is attached. Between the guides, embracing the piston rod end, there is a two-part upper crank bearing attached to the

connecting rod head. A sketch of the guide system is presented in Figure 7.

Figure 7. Sketch of the RD76 Guide System



e) Change in the Control Post and Steering System:  
The steering system formerly applied in Sulzer engines has undergone a certain modification. The engine is still being steered with the aid of levers-- fuel and starting; however, their action on the rod and pneumatic systems has been slightly changed. As in the case of the Type RSAD engine, the fuel lever actuates the fuel pumps through the rod system, increasing or decreasing the fuel dose fed from the fuel pumps to the cylinders. In this way the fuel lever does not permit the regulation

of the engine load. The function of the starting levers, however, has been modified, so that it serves only for starting the engine and does not affect the speed or the stopping of the engine. The speed of the engine at starting is controlled by the position of the mechanical telegraph, coupled with the lever system with the control post and control systems. The engine can normally be stopped by shifting the fuel lever to zero load, or by shifting the telegraph to "stop" position. The control system of the injection pumps has been considerably simplified, while the air blocking and hydraulic control systems have been adapted to the modified design of the engine.

## Design Advantages of the Type RD76 Engine as Compared With the Type RSAD76 Engine

The RD76 engine is characterized by an ingenious design of the entire unit as well as the individual components. This could be fully done owing to the entirely new engine design adapted by the Sulzer firm. This design is based on experience of long standing acquired in the production and operation of Type RSAD engines as well as other manufactured types. This resulted in a completely new engine of considerable simplicity and great operating advantages.

The following advantages of the new engine type, as compared with type RSAD engines, result from the modifications made on the RD engines:

a) The placing of the air tank on the exhaust side permitted the shortest possible connection between the turbo-blowers and the the exhaust outlets and tank. The long air collectors in the Type RSAD76 engine not only occupied a lot of space but primarily caused losses in the pressure of scavenger air due to the air flow resistance. Moreover, its servicing was made difficult by the noise produced by the engine.

A very important advantage of the new design is the symmetrical arrangement of the supports at various inclinations of the crankshaft side walls. This considerably simplified the design and assembly of the engine. The support load, under the influence of the initial tension of the tie bars and combustion forces during operation, forms entirely symmetrical deformations on both sides of the engine.

b) The transfer of the distributor shaft to a new location and the solving of its gear mechanism with the aid of cog-wheels has a number of advantages. Owing to the elimination of the independent gear mechanisms for the exhaust reverse valves and the grouping of the fuel pumps, the distributor shaft has been considerably reduced in length. The application of a gear mechanism, consisting of cog-wheels, has definitely contributed to reducing the noisiness of the engine, by eliminating the noise of the chain gear and its runs, so characteristic of RSAD engines. The elimination of the chain gear removed the necessity of regulation which resulted from the changing injection periods and the increase of the tenional vibration amplitude of the distributor shaft.

c) The modification of the gear mechanism for the exhaust reverse valves has substantially simplified the design, in spite of the necessity of applying a separate control device for regulating the entire valve system at the changing of the direction of rotation. Moreover, the modified operating conditions of the reverse valves (rotation) provide better lubricating conditions for their bearings and ensure the latter a longer useful life.

d) The new design of the guide system has indisputable advantages. The two-way diagonal run ensures the entire system a higher stability in operation. With the inclusion of the back-run in the Type RSAD engine, which employs individual guides, the load is shifted to the slide bar screws and, owing to the less active surfaces of the slide bars, considerable pressure per surface unit. In connection with this, the operation of the engine is less reliable with the inclusion of the back-run and, although the possibility of operation at back run is not excluded under full load, the application of part loads is recommended. The Type RD engine, in view of the application of a two-sided diagonal, can operate in both directions under full load and with equal reliability.

Another great advantage of the guide system is the execution of the connecting rod head as a uniform part, without the present traditional bifurcation used in other engine types. Where bifurcated connecting rod heads are used, and the prescribed assembly rules regarding the axle breakdown in both bearing parts are not carried out, untimely wearing out of the bearings occurs, or in certain cases they are completely destroyed. The uniform head of the connecting rod in the Type RD engine, which has one flat upper surface, eliminates in advance the difficulties arising from the above-mentioned causes.

e) The modification of the control post introduced in Type RD engines must objectively be considered favorable. It facilitates to a certain extent the controlling and supervision of the engine. This pertains primarily to the operation of the starting lever. On starting the engine, the attendant does not have to pay attention to the direction of rotation, since this is controlled by the mechanical telegraph. This simplifies the servicing of the engine and excludes the possibility of mistakes on the part of the attendant with respect to the direction of rotation.

The above presented advantages pertaining to the new design features applied in the Type RD engine do not exhaust this problem. The Type RD engine has better access to all major components than the Type RSAD76. This not only permits better supervision of the engine in operation but facilitates dismantling and changing of various components. The favorable access to the individual components and the far-reaching conveniences connected with the repair or restoration work will be appreciated, in the first place, by ship mechanics while carrying out inspections and repair work in the tide conditions prevailing in ship power rooms.

Furthermore, the changes introduced into the Type RD engine contributed considerably toward reducing the specific weight of the engine. The specific weight of the Type RSAD76 six-cylinder engine is 46 kilograms per horsepower, while that of Type RD76 engines is 41 kilograms per horsepower.

#### Type 6RD76 Engine Test Results

The first Type RD76 six-cylinder engine was subjected to tests at the Sulzer Brothers Plant in Winterthur in July and August of 1959. The above engine, as a prototype, was thoroughly investigated as far as possible, from the viewpoint of achieving better results as well as in order to test the reliability of the respective components in the new design. The tests and investigations conducted on gas as well as heavy oil gave entirely satisfactory results and offered a possibility of increasing the capacity of the engine by over 15 percent at the same speed.

In planning the Type RD76 engine on the basis of the Type RSAD76 engine, it was initially intended to obtain the same nominal capacity--that is, 1,300 horsepower per cylinder at an average effective pressure of 6.97 kilograms per square centimeter--maintaining the stroke and diameter of the cylinder unchanged. The favorable results permitted the Sulzer firm to increase the nominal capacity of the engine to 1,500 horsepower per cylinder at an average effective pressure of the cylinder of 8.05 kilograms per square centimeter. It should be noted that the increase in capacity will not affect the reliability of the engine in a negative way. As calculations and measurements indicate, the actual load of the

individual engine components does not exceed the admissible values, which guarantee their long life and reliability in operation.

The measurement results of the characteristic values of the first Type RD76 engine taken at increased capacity do not substantially deviate from the values obtained in Type RSAD76 engines.

The fuel consumption at nominal and operating capacity, an important factor for the user, has undergone practically no changes with respect to the Type RSAD76 engine. Further studies give good reason to believe that in the future the unit consumption of fuel will be reduced by a few grams.

The remaining parameters, less essential for the user, have been changed insignificantly. This pertains to the speed of the turbo-blowers, the temperature of the exhaust fumes before and after the turbines, the exhaust counter-pressure, the scavenger air pressure, and the combustion pressures. The characteristic curves of the Type 6RD76 engine--capacity 1,000 horsepower per cylinder, at 119 revolutions per minute--are presented in Figure 8.

The observation of the first engine in operation led to the further assertion that, besides being easier to service, it produces considerably less noise than the Type RSAD76 engine. Similarly, the operation of the fuel pumps is incomparably smoother, which should affect their service life.

#### Characteristic Data of Type RD Engines

The series of Type RD engines consists at present of the following engine types: RD68, RD76, and RD90. In view of the fact that Types RD90 and RD68 are in the preparation phase for production and in design development by the Sulzer firm, the Type RD76 engine is the basic RD engine type in serial production. The serial production of Type RD90 engines will be launched by the Sulzer firm in 1960.

All type RD engines will be based on a similar design. In connection with this, the production of the respective engines will be highly simplified in view of analogous technological processes, tooling, etc. The RD series will also include, as

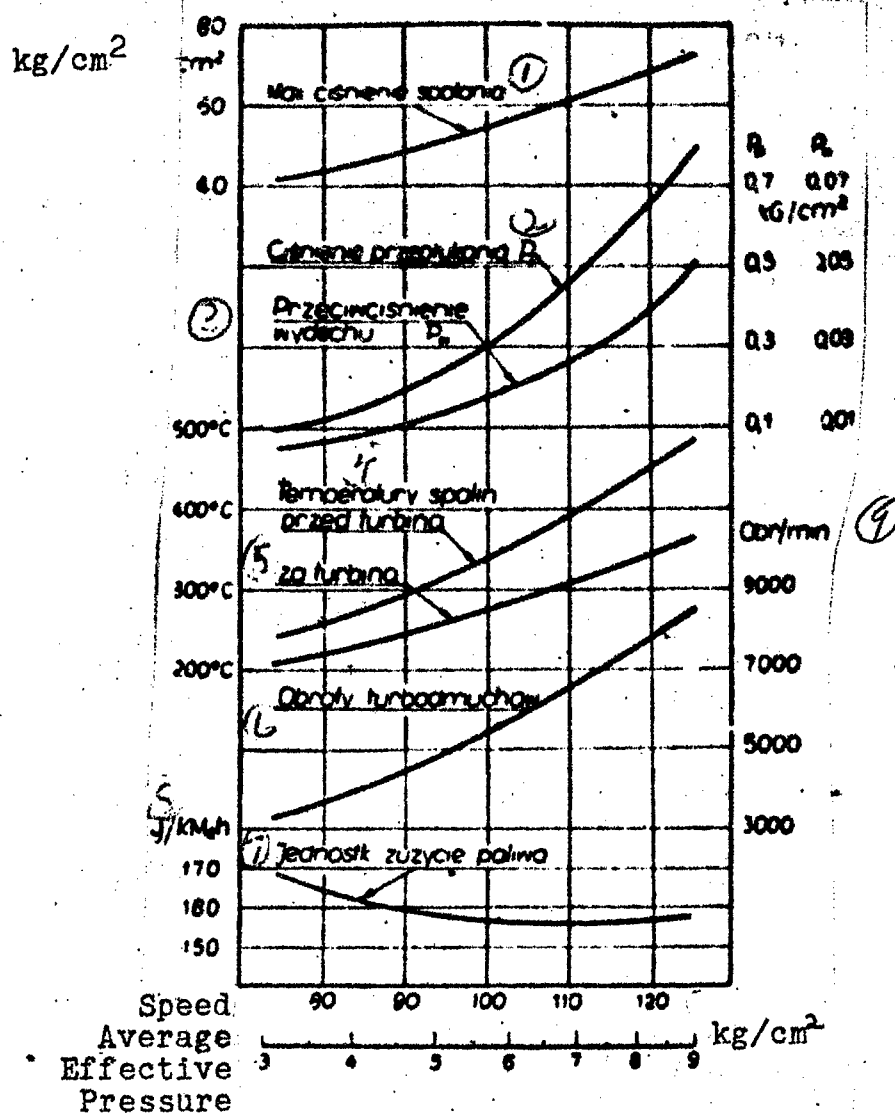


Figure 8

Characteristic Curves of Type 6RD76 Engine,  
Nominal Capacity 1,500 Horsepower per Cylinder at 119 Revolutions per Minute

- |  |                              |
|--|------------------------------|
| 1) Maximum combustion pressure             | 5) after the turbine         |
| 2) Scavenging pressure $P_p$               | 6) turbo-blower speed        |
| 3) Exhaust counter-pressure                | 7) per unit fuel consumption |
| 4) Exhaust fume temperature before turbine | 8) grams per horsepower hour |
|  | 9) revolutions per minute    |

planned, an engine of about 700 horsepower per cylinder capacity with a piston diameter of about 500 millimeters. The Sulzer firm is proceeding at present with the development of this engine, which is temporarily designated as Type RD56. Its final design is being worked out.

The principal characteristic data of Type RD engines are presented in Table 1, and its dimensions in Figure 9 and Table 2. The dimensions and weights shown in Table 2 are preliminary values, which will be finally adjusted during the production of these engines.

Table 1

ok = about

Engine Type	Number of Cylinders	Cylinder Diameter in mm	Piston Stroke in mm	Nominal Capacity per Cyl. HP/Cylinder	Revolutions per Minute
RD 56 (in design)	—	ok. 500	ok. 1000	ok. 700	—
RD 68	5 ÷ 12	680	1250	1100	135
RD 76	5 ÷ 12	700	1550	1500	119
RD 90	6 ÷ 12	900	1550	2000	119

In presenting an outline of the Type RD engines, we wish to introduce their characteristic data and design features to the Polish shipbuilding industry for purposes of familiarization. We hold that this industry, following the technical advances and aiming toward equipping newly built ships with the most advanced engines, will properly appreciate the advantages of the Type RD engines as well as the existing opportunities of domestic production of these engines by the H. Cegielski Plants.



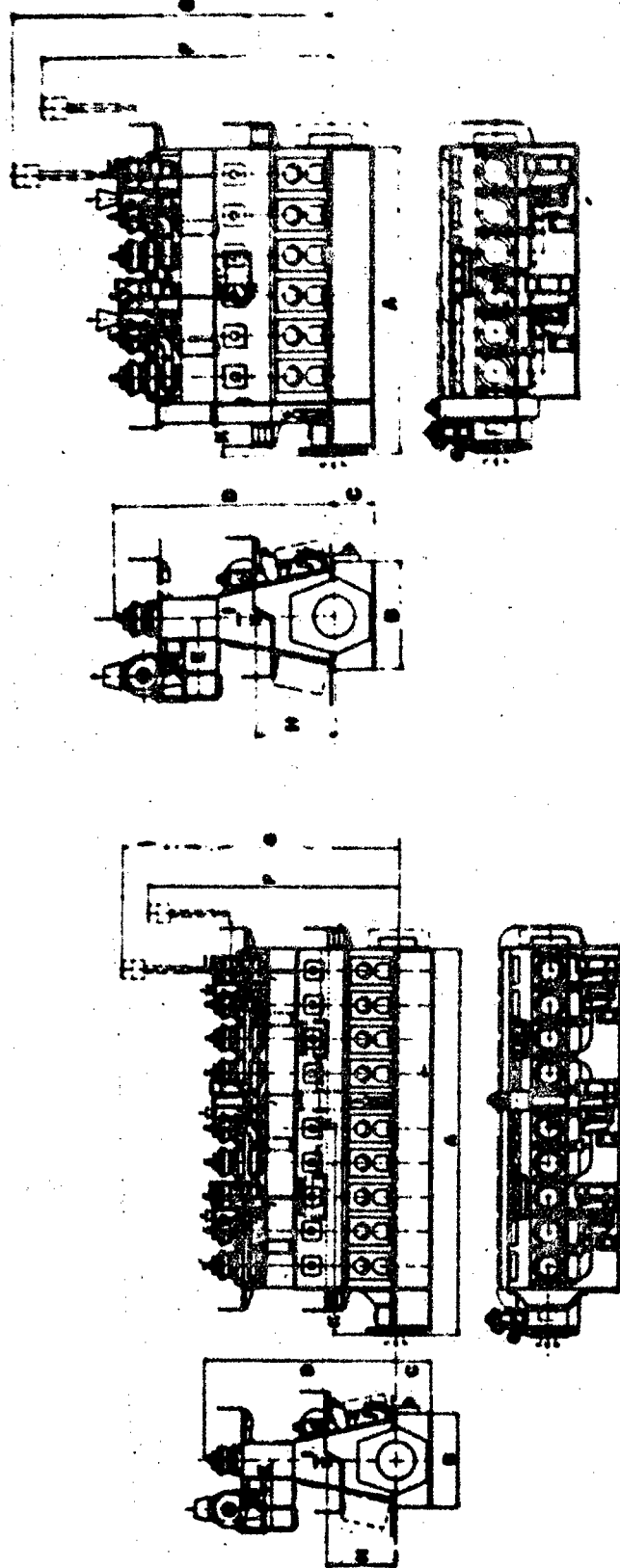


Figure 9  
Dimensioned Drawing of Type RD Engines

Table 2

Type	Description	Number of Cylinders										
		5	6	7	8	9	10	11	12			
RD 68	A	8360	9650	11630	12960	14250	15760	16960	16160			
	B 3050, C 1250, D 6350, E 2250, F 8400, G 9250, H 2150, I 90, K	4535 5500	5200 6900	6255 7700	6940 8800	7360 9800	8240 11000	8875 12100	9645 18200			
	Horsepower											
	RPM 135 Weight in tons	213	247	295	329	366	400	484	471			
RD 76	A	8370	10750	13000	14100	15800	17200	19600	20000			
	B 3800, C 1400, D 7830, E 2850, F 10300, G 11300, H 2850, I 110, K	5240 7500	5940 9300	7095 10500	7800 12000	8500 13500	9230 15000	9915 16500	10845 18000			
	Horsepower											
	RPM 119 Weight	324	376	438	479	543	594	651	706			
RD 90	A		12515	15265	16945	18025	20305	21985	23865			
	B 4000, C 1500, D 8070, E 3150, F 10750, G 11500, H 2835, I 120, K		6835 12000 510	8185 14000 600	9075 16000 670	9805 18030 750	10785 20000 823	11600 22000 892	12455 24000 960			
	Horsepower											
	Weight in tons											

Remarks: 1. The gear mechanism for the distributor shaft in five- and six-cylinder engines is located at the end of the engine; in other engines at the center of the engine.

2. All dimensions are given in millimeters.

3. The weights are given in tons, taking account of the water and oil

## POLAND

### Conversion of the S.S. Pulaski into a Fishing Mother Ship

[This is a translation of an article by Tadeusz Buczkowski in Budownictwo Okretowe, Vol V, No 1, January 1960, Warsaw, pages 24-25; CSO: 3793-N/b]

The wreckage of the M/S Morska Wola fishing mother ship and the decision to scrap it has placed before the fishing enterprises in March 1959 the task of replacing the mother ship before the start of the summer fishing season. The present organization of the fishing activities requires at least two mother ships, serving alternately in the fishing grounds of the North Sea. At the end of July 1959 the S.S. Pulaski replaced the S.S. Kaszuby, which at that time operated at one of the fishing grounds. During the period from April to July, the S.S. Pulaski underwent the necessary changes and adapted to its new operating conditions.

The S.S. Pulaski was built in 1928 by Flensburger Schiffbau Gesellschaft, and in 1948 was modernized by the Mercantile & Graving Dock Shipyards in Antwerp. It is a turbine-driven, single-propeller "protection-deck" ship, which at present develops 14 knots. The boilers are fired with heavy oil and the total capacity of the installed generators is 180 kilowatts. All the ship mechanisms are steam-driven. The loading equipment consists of 12 booms of 3- and 5-ton loading capacity, and two booms of 40-ton capacity. The carrying capacity of the ship amounts to about 10,000 deadweight-tons. The hull structure is entirely riveted. The living quarters are designed for 75 persons, including 12 passengers. The ship has good stability and good marine properties. Recently it was covering the Far East Line.

The conversion of the S.S. Pulaski was carried out by the Gdansk Ship Repair Yards, which performed 60 percent of the work connected with the conversion, whereby more than half of that work was carried out during the last month of the conversion period. The remaining work was divided among the following cooperating enterprises: Szczecin Shipyards (steel construction of the middle part), Boiler Construction Cooperative (stern work), "Gryf" Repair Enterprise (plumbing and



Figure 1

Fishing mother ships "Morska Wola" and "Pulaski" at the Gdansk Ship Repair Yard in the summer of 1959. The M.S. Morska Wola is moored to the starboard of the S.S. Pulaski so that equipment can be transferred to the latter before the former is scrapped.

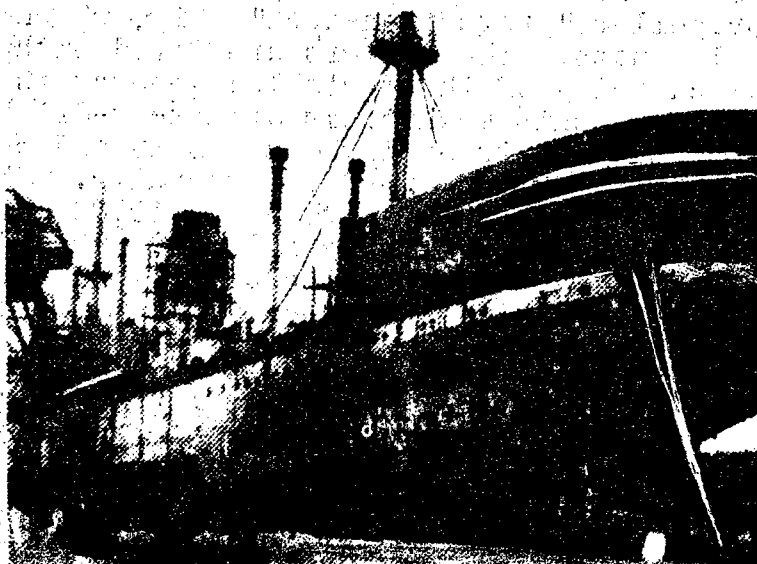


Figure 2

Erection of the second story and superstructure on the stern of the S. S. Pulaski

central heating), Gdynia Ship Repair Yard (rewinding of electric motors, furniture), "Port Service" Cooperative (tank cleaning), Navy Shipyards (steel structure elements, furniture), Mikolow Machine-Building Plant (repair of electric generating equipment).

The conversion project was prepared by the Marine Stock Designing Office (Biuro Konstrukcyjne Taboru Morskiego). It consisted of two stages: conceptual and working. The close cooperation of the Designing Office with the shipyard rendered the actual introduction of the final design elements into production.

#### Extent of Conversion

The first conversion stage, which consisted in carrying out the most vital work connected with the adaptation of the vessel to fishing and operating requirements for the approaching fishing season, was completed in July 1959. Hold No 3 was converted into four drinking water tanks of a total capacity of about 800 cubic meters. The inter-deck space was converted into a food storehouse: a part of that storage space designated for storing of vegetables will be cooled with "Sabroe" freon equipment, which will be built in during the second stage. Piping systems for delivering water and crude oil at the fishing grounds to units approaching the stern were installed. The upper inter-deck space of Hold No 1 was designated as storage space for fishing nets. The inter-deck space of holds No 3 and 4 has been converted into cabins, storage space (equipment and clothing), repair shops (radio and electric), a pantry, two dining halls for about 100 people, a cinema of about 60 seats, a barber shop, laundry and drying room. The existing reading room at the stern has been converted into sanitary accommodations. All the cabins in the inter-deck space are for four people and are provided with supply and exhaust ventilating systems, as well as with steam central heating systems. The cabins are insulated with vinidur foil and plywood; the floors have been made of hardened "litosilo," and, in the sanitary accommodations, of ceramic tiles. The walls and ceilings in the sanitary accommodations, shops, and storage areas have been sprayed with granulated cork and painted. The inter-deck space is provided with two exits to the starboard side and safety deck, consisting of watertight hatchways.

The vessel has been extended in height by one story at the stern and ship center. The superstructure at the stern contains accommodations for the crew in the form of two- and three-passenger cabins, a reading room, baths for the fishing unit crews, and a cooper shop. The extended center part contains a hospital and dispensary accommodations (treatment rooms: medical and dental, X-ray, pharmacy, isolation room, four-bed hospital), a radio service room, as well as two- and four-passenger cabins. The wings of the navigation bridge were also raised by one story, and this space was designated for single-passenger cabins and the radioroom. The accommodations in the superstructures were provided with running water and natural ventilation. The coal-operated kitchen has been expanded and adapted to the use of crude oil.

Thus, the converted vessel can accommodate a crew of 240 (including the working crew), and carry about 40,000 barrels, 1,600 tons of drinking water, 1,140 tons of crude oil, and 1,250 tons of heavy oil. In connection with its conversion, the stability of the vessel has been considerably reduced, and this calls for strict observation of the requirements contained in the "Captain's Stability Rules."

#### Further Conversion Program

The "Gryf" Enterprise plans to continue the conversion of the vessel during the next two winter seasons. The further conversion program calls for an increase in the water tank capacities in order to mitigate the present water shortage, as well as for the adaptation of one of the holds for the transportation of coal, including transloading equipment. Subsequent plans call for the insulation and cooling of all the holds and the expansion of the installed electric power connected with it.

#### Problems Connected with the Conversion Program

The basic problem of the project was the layout of the increased number of living and social quarters without excessively affecting the loading capacity of the vessel on the one hand, and without changing the silhouette of the vessel

through excessive superstructure additions on the other. The present compromise was reached by means of a certain reduction in the visibility from the steering room toward the stern, because of the superstructure on the stern. Other considerations which affected the design were stability and trim under operation conditions.

For practical reasons, it was decided to introduce new strength elements (bulkheads for water tanks) in totally welded versions. The diagonal bulkhead has been connected with rabbets through welding, whereby all the rivets which connected the rabbet frames with the boarding have been changed and their spacing reduced. Owing to the considerable use of bondings and the presence of leaks, as well as the necessity of connecting the deck with the starboard sides, the tasks became extremely difficult. Similar difficulties arose in connection with sealing the high-water and fuel tanks.

The erection of the superstructures, carried out in a joint effort, did not cause any special difficulties. Tests carried out with safety boat cranes mounted on the light center structure gave positive results.

The S.S. Pulaski was purchased for 12 million zlotys. The first conversion phase cost about 16 million zlotys. The cost of further conversion stages within the planned framework will amount to about 20 million zlotys. The thus obtained fishing mother ship is expected to operate for a period of eight years.

The problematical quality of the vessel resulting from the conversion should incline ship building enterprises to reflection and thorough study of the expediency of funds invested in the conversion of obsolete units.

## POLAND

### Production and Development of Construction and Road-Building Machinery in Poland

[This is a translation of an article by Docent A. Wislicki in Stroitel'noye i Dorozhnoye Mashinostroyeniye, Vol V, No 1, January 1960, Moscow, pages 9-14; CSO: 3781-N]

The production of construction and road-building machines is a new branch of technology in Poland; it is only ten or eleven years old. The creation and development of this production is closely connected with the rapid growth in the volume of construction.

In 1958 the volume of construction and assembly work had risen 2.8 times over that of 1950, and by 1965 it will have increased 1.75 times compared with 1958.

During the same period (1958-1965), the total number of workers, engineers, technicians, and employees working in construction will increase only 30 percent. Thus, the increase in the volume of construction is being accomplished to a considerable extent by means of increased labor productivity, in which a decisive role is played by mechanization of construction operations.

In connection with the above, it is planned that by 1965 all all basic earth-moving operations--vertical transportation, production of concrete mixers, and certain other types of work--will be mechanized.

The total weight in tons of construction and road-building machines turned out in 1958 had increased more than 30 times in comparison with 1950. A further significant increase in the production of construction and road-building machines is planned for the 1960-1965 period.

In 1950, only the simplest machines, such as concrete mixers, solution mixers, elevators, and rams were produced.

In 1955, two and one-half times more types of machines were produced, including such machines as excavators with buckets



having volumes of 0.5 to 1.0 cubic meters and tower cranes with 30- to 45-ton meter loading moments; in 1965, still more types and sizes of basic construction machines for working and moving earth, building motor-vehicle roads and railroads, and minor mechanization for such things as finishing, sanitation, and other operations will be produced.

To increase serial production and lower the cost of production, Polish industry is taking a number of steps in the standardization of parts and is making deliveries on the foreign market. The production of construction machines is now being directed for export.

Polish machines and equipment used in the production of light concrete are already being utilized in Soviet plants for producing construction materials.

The Soviet Union has played a large part in the development of Polish construction and road-building machinery. It has supplied, free of charge, technical documentation and experience in the production of machines. In addition, it took over the organization and training of Polish specialists in scientific research institutes and in the plants.

The use of the experience of Soviet specialists eliminated the growing pains of the young Polish industry within a relatively short time. The industry was equipped with new machinery and was adapted to new conditions, so that it could proceed with its own original designing concepts.

One of the first projects was the adaptation to Polish conditions of KU 501 and KU 1001 excavators, of Soviet design. The problem consisted in using Polish motors and also in making possible the transportation of the excavators on normal railroad flatcars and on European rails. As a result, the new types of KU 503 and KU 1206 excavators were created.

The KU 503 excavator is powered by a new Polish 75-horsepower motor weighing 900 kilograms. This excavator uses hydraulic steering with revolving sliding valves, which improve the operator's control. The 0.5-cubic meter bucket of the excavator is adapted to automatic "Star" dump trucks having gondolas which carry three buckets of dirt. The same excavator can use an 0.75-cubic meter bucket at combined pressure.

The bucket volume of the KU 1206 excavator (Figure 1) was increased to 1.2 cubic meters.

A Diesel-electric excavator with an 0.25-cubic meter bucket is in production. This machine has pneumatic tires, and the rear wheels can be exchanged for half tracks. The excavator has a 54-horsepower Diesel motor, powering a three-phase generator of 240/380 volts.

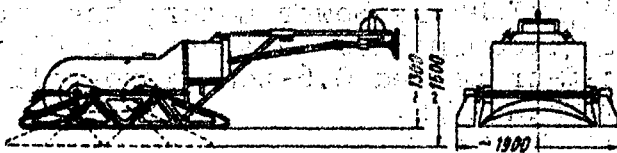
The electric motor can also use power from the network. A special type of the same excavator may be mounted on a barge for land improvement work. Simultaneously, preparations are in progress for the production of an excavator with an 0.2- to 0.25-cubic meter bucket with mechanical transmission, and also a hydraulic excavator with the same size of bucket (Figure 2).

It must be noted that Polish industry is actively engaged in the adaptation of modern hydraulic transmission for excavators, loaders, cranes, pipe-bending equipment, brakes, and other devices. These transmissions are being carefully tested, their details worked out, and their separate elements tested.

In addition to the single-bucket excavator, various types of multi-bucket excavators--for example, KV 251 and KV 161--are produced in Poland for utilization in the quarries of brick plants. The KV 251 excavator has a 20.5-kilowatt motor and is equipped with 35 buckets having a capacity of 25 liters each, whereas the KV 161 excavator has 27 16-liter buckets. The KR 2 trench excavator is considerably different from the two foregoing examples, since it is primarily for the purpose of digging trenches 0.4 meters wide and 1.2 meters deep, at the rate of 25 to 60 meters per hour. This machine weighs two tons and can easily be used for digging trenches for cables, for water and canalization pipes, etc. Hydraulic controls are used in this excavator.

In the field of earth-moving machines for layer cutting, plans have been made for the production of 120-horsepower auto graders and self-propelled scrapers.

There are problems of soil compressing connected with earth-moving operations. A VSM-2 striding vibro-compactor (Figure 4) with a 30-kilowatt electric motor is produced in Poland for this purpose. Compacting is



achieved at a vibration rate of 400 to 1,000 per minute. This machine can compact soil to a depth of 2 meters with a forward movement of 3 to 10 meters per minute.

Figure 4. VSM-2 Striding Vibro-Compactor

For self-propulsion, the machine uses a striding device which permits movement (without compacting) at a rate of 20 meters per minute. The vibro-compactor has three forward speeds and two reverse speeds. This original design, not yet found in similar devices, permits movement over obstacles such as embankments, railway tracks, etc.

The production of striding vibration soil compactors required extensive scientific research, in which the designers were aided by the All-Union Scientific Research Institute for Construction and Road Machine-Building in Moscow. Polish motorized rollers are of simple construction, ensuring reliable service for road-building and road repairs at great distances from bases and repair workshops.

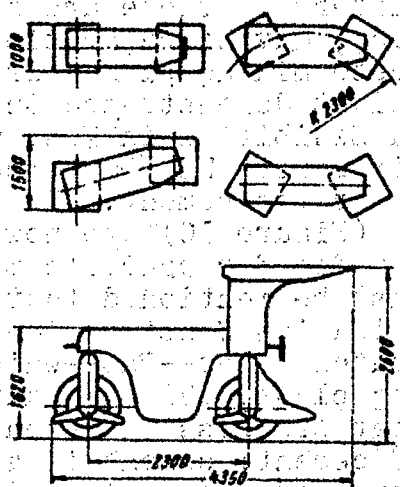


Figure 6. Operating Diagram for VD 5-6 Motor Roller

Motor rollers weighing 5 to 6, 7 to 9, 8 to 10, and 10 to 14 tons are now manufactured in Poland. They are powered by Diesel motors, and, while the steering of the 7- to 9-ton rollers is hydraulic, it can be shifted to mechanical. A change in the weight of the roller, which might be necessitated by particular requirements of the work at hand, is achieved by means of ballast.

The drive and steering used on the two-roller 5- to 6-ton machine is of special interest. Each of the rollers has an independent drive and an independent steering mechanism. This permits rolling

of a strip 1.5 meters wide with a one-meter roller.

The production of 2- to 6-ton vibrator rollers having a compacting effect corresponding to that of static rollers of 18 tons has been started. The vibration element of these rollers is the rear roller, which makes 1,900 to 3,600 vibrations per minute. It has an 18-horsepower motor; the width of the vibration roller is 1,000 millimeters and its diameter is 750 millimeters. A self-propelled 0.6-ton vibro-roller with a mono-roller is in production.

Vibration methods are also applied to pile drivers. The BTs 3 vibro-hammer, weighing 600 kilograms, and having a frequency of 470 to 970 cpm [strokes per minute?], and the BTs 5, weighing 1,200 kilograms and having a vibration frequency of 720 to 1,400 cpm, are being produced.

In addition to motor rollers for road building, a number of special machines are manufactured--for example, the VV 7.5 vibro-finisher and a unit for processing rubble (Figure 7), with a productive capacity of 6 to 8 tons per hour. The unit consists of a drying and sorting device. The same factory manufactures other machines incorporating the above-mentioned units.

Considerable work has been done in Poland in the mechanization of concrete work and transportation of cement. A series of concrete mixers with capacities of 55 to 1,000 liters are in production, including some which are movable and contain tilting drums with capacities of 135 liters or nontilting drums with capacities of 250 to 400 liters. There are also concrete mixers with automatic stirring, having capacities of 125 and 500 liters. Mechanized concrete mixing plants are being created. The concrete mixing plant demonstrated in 1959 (Figure 9) in 1959 at the Polish Exhibition in Moscow consists of a new type of concrete mixer with MB 500 forced action and a built-in scale and silo for the cement. In addition, carousel metering machines (Figure 10) are now manufactured in Poland. They are provided for concrete mixers with a capacity of 500 liters. It must be mentioned that the Institute for Organization and Mechanization Construction in Warsaw has devised a semi-automatic batch meter--YaC--which is incorporated into a concrete mixing plant; this has already been tested and is in operation. Great progress has been made with regard to bulk transportation of cement: cement is aerated into cement carriers by means of compressed air from compressors driven by separate motors.

Cement carriers consisting of a truck and trailer (Figure 11) are manufactured in Poland. Such units transport 20 to 22 tons of cement and can be unloaded within a period of 30 to 40 minutes. During unloading, cement can be delivered up to a height of 8 meters. The total weight of the unit with load is 39 tons. The practice of transporting cement in bulk is so widespread in Warsaw, Krakow, Katowice, and other cities that cement silos are normal features in building areas there.

In the future they will be provided with weighing and metering devices. The production of railway cars for cement transport is under way. These will be provided with the same equipment as motorized cement carriers. District cement reloading stations are being built. A convenient trailer of the IOMB-SOKh type (Figure 12) for the transportation and erection of cement silos has been built. This type of trailer simplifies the transportation and erection of silos and eliminates the need for additional hoisting devices. With the above-mentioned equipment, bulk transportation of cement will represent 50 percent of the total volume by 1965.

An 8-cubic meter concrete carrier mounted on a "Star" chassis (Figure 13) is used for the transportation of concrete mix. The concrete mix is moved by pneumatic pumps, adapted for use with concrete mixers of capacities of 200 and 500 liters.

The mechanization of loading and unloading is a serious problem in Poland. It was ascertained that, of the total number of construction workers available, 30 percent are used for this kind of work.

A number of machines were devised to mechanize this work. Mechanical shovels of 0.18 cubic meters, powered by 3.8-kilowatt motors, having a traction power of 700 kilograms, are now in production (Figure 12). The rating of such a shovel is 25 to 30 cubic meters per hour, and it is especially suited for the unloading of sand and gravel from railway trucks. A self-propelled L-40 single-bucket loader (Figure 15) is manufactured. It has a hydraulic drive and a 40-horsepower motor. The machine has an 0.6 cubic meter bucket turning 100 degrees to each side. The rating of these loaders is 100 tons per hour.

Self-propelled, slow-moving cranes of the "Pozdernik" type are used for unloading piece goods. They have a lifting capacity of 3 tons (the same as truck-mounted cranes on "Star"

chassis). The production of modern hydraulic ZSKh-4 cranes (Figure 16) with a lifting capacity of 4 tons and a radius of 2.5 meters has just begun. The crane has a 40-horsepower motor and a maximum speed of 22.3 kilometers per hour.

A motorized loader with a 3-ton rating, a hydraulic drive, and a turbo clutch is also in production. These motorized loaders are now being tested.

The mechanization of vertical transportation utilizes cranes of modern design with counterweight mechanisms located in the lower part of the tower. These cranes can be moved on curved tracks and also on tracks that are not precisely parallel.

The standard machine is the ZhP 45 tubular crane, having a rating of 2.25 tons at a 20-meter radius and a lift of 26 meters. Its boom is provided with a carriage permitting horizontal transportation of a 2.25-ton load. Its lifting speed is controlled over a range of 6.1 to 24.5 meters per minute, which is especially advantageous during the assembly of reinforced concrete steel structures. Because of their advantages, these cranes have been purchased by several countries, including Czechoslovakia and East Germany. Detailed analysis reveals that there are reserves of power, so that the lifting capacity can be increased to 3 tons at a radius of 20 meters with scarcely any structural alteration.

There is another interesting crane with a load moment of 30 ton-meters designed in accordance with the design of Soviet tubular cranes.

Cranes of this type will be produced with a loading moment of 40 to 50 ton-meters with no change in the weight of the structure, which is 18 tons. The production of two more ZhB 20 and ZhB 120 cranes has begun. The technical specifications of Polish power cranes will compare favorably with crane specification of leading foreign firms.

#### Technical Characteristics of Polish Tower Cranes

	ZhB-20	ZhB-30	ZhB-45	ZhB-120
Lifting capacity, tons:				
At maximum radius	1.1	1.5	2.25	4.0
At minimum radius	2.2	3.0	6.0	10.0
Radius, in meters: maximum	18	20	20	30
minimum	6.5	10	3.8	12
Hoisting height (m): maximum	32	40	43.5	57
minimum	20	26	26	32
Hoisting speed, meters/minute	15-30	20-40	6.1-24.5	15-30

For the transportation of large sidewalk plates manufactured in Poland, there are now 10-ton trailers of two types--one for vertical loading (Figure 17) and one for horizontal loading.

Polish industry has also started production on machines for minor mechanization and finishing work. Of great help in this respect was an exposition held during May and June 1959, in Gliwice, where samples of equipment manufactures in the USSR, East Germany, and Hungary were shown. In addition to the creation of new types of machinery, the complete modernization of machinery already in production is being carried out. The use of hydraulic drives, vibration methods, and the standardization of parts will materially lower the costs and improve the operational factors. These plants are based on serious scientific work carried out by the Chair of Construction and Road-Building Machines of Warsaw Polytechnic Institute, as well as by the Institute for the Organization and Mechanization of Construction, and other scientific institutions.

In discussing the production and designing of road-building machines, it must be mentioned that a considerable amount of work is being done in connection with the production of spare parts for these machines; such parts are now being made in a few specialized plants.

#### Photo Captions

Figure 1. KU 1206 Excavator

Figure 2. Hydraulic Excavator with an 0.25-cubic meter Bucket

Figure 3. KR 2 Trench Excavator

Figure 5. VTD 8-10 Motor Roller

Figure 7. Rubble-Processing Unit for Asphalt-Concrete Surfacing

Figure 8. "Zafama 250" Concrete Mixer

Figure 9. Concrete Mixing Plant, Capacity 19 cubic meters per hour (loading shovel in front)

- Figure 10. Carousel Metering Machine
- Figure 11. Cement Carrier with Trailer Mounted on a "Tatra" Chassis
- Figure 12. IOMB-SOKh Trailer for Transportation and Erection of Cement Silos
- Figure 13. Concrete Carrier, Capacity 2 cubic meters, Mounted on a "Star" Chassis
- Figure 14. Mechanical Shovel
- Figure 15. Self-propelled L-40 Hydraulic Loader
- Figure 16. Self-propelled ZSKh-4 Hydraulic Crane
- Figure 17. Trailer for Transportation of Large Sidewalk Plates (standing)



## RUMANIA

### Economic and Geographic Aspects of the Danube Delta

[This is a translation of excerpts from an article by Ioan Popovici in Natura, Vol XI, No 6, November-December 1959, Bucharest, pages 23-25, 27-34; CSO: 3783-N]

This article deals especially with the part of the Danube consisting of the Letea, St. Gheorghe, and Dranov (river) isles, which are all included in the Tulcea administrative raion.

#### Physical and Geographic Aspects:

The Danube Delta begins at Ceatalul Ismail. Here the Danube forms two arms--the Chilia arm, which after 115 kilometers empties into the Black Sea through a secondary delta; and the Tulcea arm, which after 19 kilometers also divides into two arms at Ceatalul St. Gheorghe: namely, Sulina--which traverses the Delta center for 63 kilometers--and St. Gheorghe, 109 kilometers long, which empties into the Black Sea at two openings.

Usually, the Delta is taken to mean the areas between Ceatalul Ismail, the Black Sea, and Pliocene platform of Bugeac and the Hercynian massif of Dobrogea, also including the Razelm complex. Within these limits, the Delta occupies 5,050 square kilometers, of which 4,340 square kilometers are on Rumanian soil and the rest on Soviet territory.

The three main arms of the Danube divide the Delta into two [sic] large isles, usually called "islands:" Letea "island" (153,000 hectares), between Chilia and Sulina arms; St. Gheorghe "island" (100,000 hectares), between Sulina and St. Gheorghe; and Dranov "island" (84,500 hectares), between St. Gheorghe and the Razelm complex. To these should be added the areas occupied by the Razelm complex (88,000 hectares) and the beds of the Danube arms (8,500 hectares).

The Delta itself (Letea and St. Gheorghe) occupies an area of about 253,000 hectares.

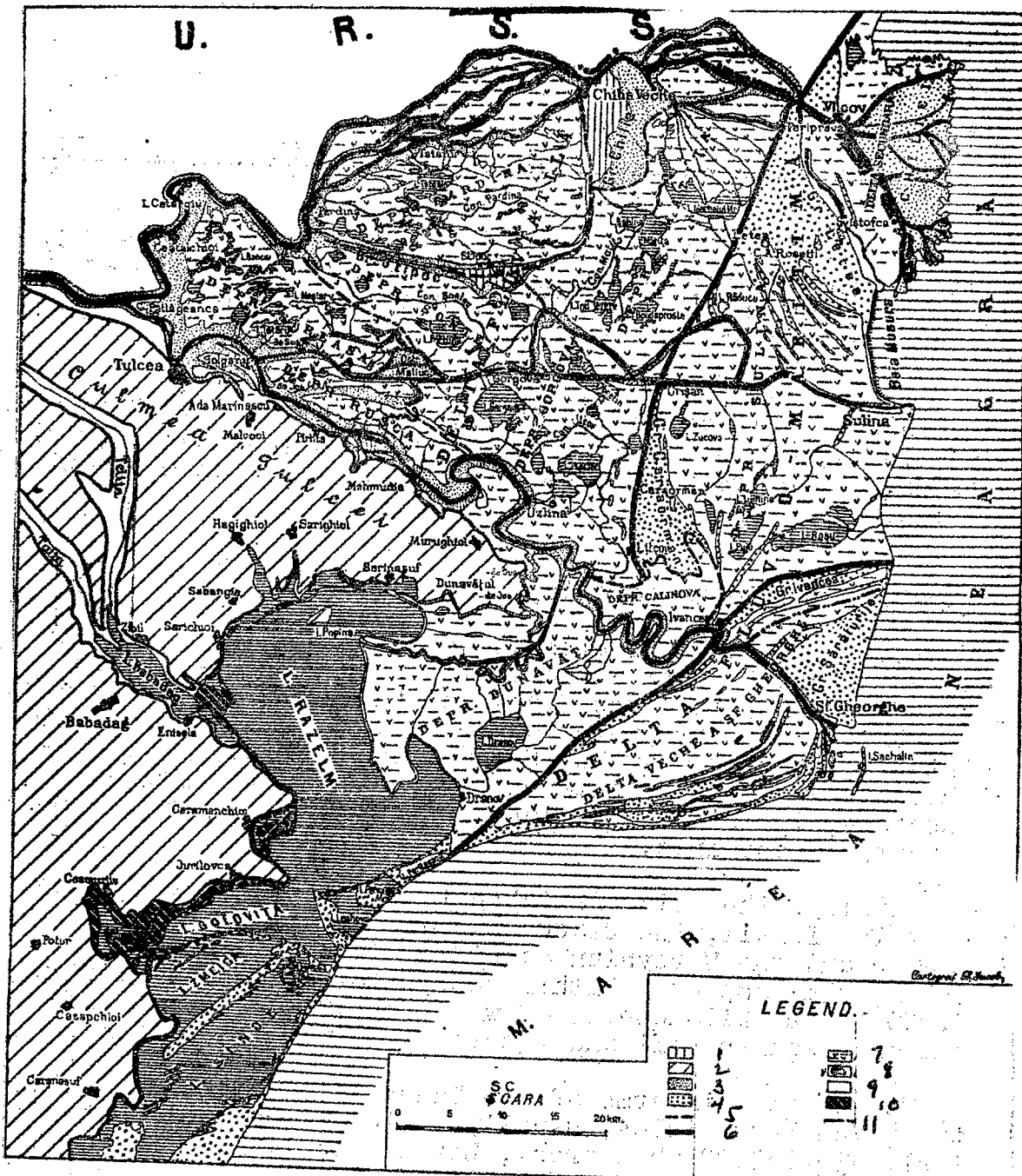


Figure 1. Morpho-Hydrographic Map of the Danube Delta.  
(according to V. Mihailescu and A. Banu)

- |  |  |
|--|--|
| 1) Loess plain                         | 7) Fluvial biogenic alluvia, inundated and inundable |
| 2) Hercynian massif                    | 8) Lakes, ponds, lagoons                             |
| 3) Fluvial banks                       | 9) Meadows   |
| 4) Maritime banks                      | 10) Lake beach                                       |
| 5) Depression boundary                 | 11) One of the old arms of St. Gheorghe              |
| 6) Boundary of interior maritime banks |  |

As a morpho-hydrographic unit, the Danube Delta is a deltaic plain still in formation, which has been and continues to be formed by the combined action of the Danube and the Black Sea.

In relief, the Delta is a low plain. About 80 percent of its surface is almost always covered by water; the other 20 percent consists of temporarily innundated embankments and banks.

Banks of continental, fluvial, and fluvial-marine formation are found in the Delta, which illustrates the housing and agricultural potential of the Delta.

The Chilia Bank (6,100 hectares) is proof of a pre-deltaic dry period; in the northern part it reaches the maximum heights found in the Delta (6.5 meters). This constitutes the main agricultural area of the Delta; mainly wheat and rye are cultivated. In the north, near the locality of Chilia veche, a light brown steppe soil layer is to be noted, which continues toward the south and east as a thin strip of light brown, phreatically humid, steppe soil; on its borders solonchak soils gradually appear. The cultivated area is not innundated, and the bordering pastures can be enlarged by embankments; it is also necessary to decrease the salinity.

The Stipoc Bank (2,900 hectares) is not as high (2 to 3 meters) and almost completely innundated during large earth-mass driving (viituri); its shape is that of an arc of circle, between the Pardina locality and the Chilia bank. Its highest parts are in the center (2.20 to 2.70 meters); it is innundated during normal earth mass driving. Agriculture is carried on in the central part (Stipoc, Fintina Dulce villages), whose areas can also be increased by embankments; the rest is used for pastures in periods of small earth mass driving.

The banks which follow the Delta arms, rivers, and canals usually vary in width between 60 and 200 meters and are formed by river alluvia. As a rule, fluvial banks have alluvial stratified soils, phreatically humid, with reduced salinity and solonchak soils in reduced proportions; they are rich in humus, azote, and other nourishing substances, and give large harvests when they are not innundated. On these dry areas and on the higher areas of the banks, vegetables, vines, fruit trees, etc. are cultivated.

Fluvial-marine banks (Letea, Caraorman, Saraturile, and smaller ones) in the eastern part of the Delta consist of quartz-bearing sand of marine origin--very poor in humus--and clay.

The Letea Bank (10,500 hectares) has sand dunes covered with forests and few spots are favorable for agriculture. Corn, rye, and wheat are planted, but even these are threatened by the sand (C. A. Rosetti village). This raised the problem of keeping the sand in place, especially by maintaining and completing the forest.

On the Caraorman Bank the forest is smaller, but on the other hand the sand dunes are partially settled.

The Danube Delta has a varied vegetation. White forests of poplars and willow trees grow on fluvial banks; mixed forests grow on the fluvial-marine banks, with the exception of the Saraturile bank, which consists of hardwood trees (oak) and softwood trees; the rest of the Delta has abundant aquatic vegetation consisting of rushes, reeds, water lilies, fir trees, and duck weed, borage, pond chestnut, etc. on the surface.

The reed-covered areas of Rumania total 360,000 hectares, of which 260,000 hectares (over 70 percent) are in the Danube Delta, which has the most compact reed zones in the world; 95,000 hectares are in the inundable zone of the Danube, excluding the Delta; the other 5,000 hectares are in various other parts of the country.

Bordering the Delta ponds are rather large with or soft wood forests, willow copses, water willows, poplars, alder trees; there are also hardwood forests and grove forests, consisting of oaks, elms, wild apple and pear trees, hazel, ash, red dogwood trees, etc. The latter are found especially on the Letea (3,150 hectares) and Caraorman (1,650 hectares) banks (so-called "Black Forest").

The delta forests settle the sand dunes and have an economic value (especially the white elements).

The extremely varied fauna of the Delta is well known in Rumania and abroad and includes ducks, geese, snipe, woodcocks, pelicans, swans, coots, cranes, storks, bustards, "tiganusi," "fluerari," brown and ash "stirci," spoonbills, vultures, otters, wild boars, hares, etc.

The ichthyological fauna of the Delta is also very important, since the Delta is the main fishing region of Rumania.

Piscicultural areas (ponds and inundable pastures) represent 83 percent of the total area of the Delta, excluding the Razelm complex.

There are 35 fish species in the Delta, of which the more common are: carp, Danube mackerel, pike, "caracuda," bass, two perch varieties (biban, salau), roach, "linul," gudgeon, two sturgeon varieties ("morun," "misetru"), etc.

\* \* \*

#### Aspects of the Geography of the Population and Populated Centers

The Number and Density of the Population. Although the Delta occupies a large area, it is much less populated than the rest of Tulcea Raion; it is one of the least populated areas of Rumania (Figure 2).

The population between the Chilia and St. Gheorghe arms is 17,000, which is less than 18 percent of the total population of Tulcea Raion (according to 1956 data).

The density of Danube Delta communes is generally less than 10 inhabitants per square kilometer, and is sometimes as low as two and three inhabitants per square kilometer, as is the case of the communities of Pardina, Crisan, and Gorgova. The active population, however, totals 44 inhabitants per 100 hectares of arable soil.

The National Structure of the Population. The greatest number is Rumanians, followed by Russian and Ukrainian. There are also Greeks (Sulina, Letea), Armenians (Sulina, Chilia Veche), and Turks (Sulina).

Russians and Ukrainians, found especially in the communities of Periprava, C. A. Rosetti, Crisan, Gorgova, the town of Sulina, and the urban type center of St. Gheorghe are more active in fishing than in agriculture and animal husbandry.

Achievements Leading to a Higher Material and Cultural Standard of Living. During the bourgeois land-owning regime, the people of Dobrogea led a difficult life. The Delta



fishermen had very few of the products necessary for living and working. According to the 1930 census, about 80 percent of the inhabitants of the Delta villages were illiterate.

During the people's regime, great progress was made regarding higher living standards in the Danube Delta.

Their supply of food and industrial products was radically improved. The commercial network now includes all populated centers. Dormitories were built at various points which are too far away from the homes of the fishermen. The fishermen are better paid and are now working with the tools of the fish enterprises.

Great progress was also made in the field of public health and the cultural level of the population. Maternity homes were created (Sulina), the number of doctors was increased, and the "Sanatatea" vessel, which is equipped with medical installations, travels through the Delta.

Schools were built at Uzliua, Salceni, Tatanir, Chilia Veche, Ilganii de Jos, etc.; some of them teach in Russian (Chilia Veche, Gorgova, Vulturul, Sulina, Periprava, Stistofca, Mila 23), or Ukrainian (Ilganii de Sus, Ceatalchioi, Chilia Veche, Pardina, Tatanir, Crisan, Letea, Caraorman, St. Gheorghe). Cultural homes were built (St. Gheorghe) and the electric network was extended (Chilia Veche, St. Gheorghe).

For the workers exploiting the Delta reeds, 60 apartments and two houses with 60 rooms were built, so that the housing capacity was 1,779 at the beginning of the 1958-1959 harvest; canteens, stores, and radioamplification stations were also provided, as well as a medical dispensary with modern equipment at Maliuc--the first of its kind in the Delta, sanitary stations, etc. Another 63 apartments were made available in 1959, as well as two public baths, and the construction of three thermal stations at Maliuc and Rusca was begun.

Population Centers. There is only one town in the Danube Delta--Sulina--which is a secondary raion town, located on a narrow and not very high bank, with a population of 3,622 (1956), most of whom are fishermen and seamen.

The "Sulina" Piscicultural Enterprise has its Headquarters at Sulina.

Besides Sulina, there is the urban type center of St. Gheorghe, on the Saraturile bank, which in 1956 had 1,475 inhabitants, most of whom were fishermen. During the people's regime this locality has developed greatly; a large center to receive and prepare fish was opened. Twenty individual apartments were built for the workers, as well as a culture palace with movie hall, library, etc.

Most of the rural populated areas center around fishing; animal husbandry and agriculture are secondary occupations of their inhabitants. Only in the western part of the Delta, in the villages of Patlageanca, Salceni, Ceatlchioi, Lascar Catargiu, inhabited mainly by Rumanians, is agriculture and animal husbandry the predominant economic factor.

New centers appeared during the people's regime, such as Maliuc and Rusca on the Crisan canal, which are important in raising the social and economic level of the Delta population. Modern research laboratories for the utilization of reeds were built, as well as blocks of apartments with sewer systems, electricity, radio connections, etc.

## Economic Aspects

The Utilization of Natural Resources. The 1956 Malicu Meeting established the main directions which the integral improvement and complex utilization of the Delta must take, namely: piscicultural production, reed production, and navigation. The following will be subordinate to the above main branches: agriculture, pomiculture, zootechnology, and silviculture.

The Utilization of Reed Resources. At the Eleventh Congress of the Rumanian Workers Party, Gh. Gheorghiu Dej stated that in the Second Five-Year Plan the cellulose industry will be developed by using the Danube reeds, since Rumania has favorable conditions for the development of this industry; this is due to the fact that there are many reeds in the Delta and their quality is superior as regards the length of the fiber and the cellulose content.

Reeds can be used by the paper industry (pasteboard, cardboard, various kinds of paper); in constructions (for protection, coverings, shelters, reed panels, "ipsos" plates reinforced with reed); to obtain fermentation products (synthetic almunin, mineral butter, ethyl alcohol, glycerine, lactic



acid, acetone, etc.); as a fuel; and in fishing to manufacture enclosures. Reed ash can be used as a fertilizer, and the alcohol and yeast obtained from reeds can be used in the manufacture of drugs (such as penicillin), etc.

The large utilization of reeds dates back only to the people's regime. In the past, this valuable raw material was not used industrially and was sometimes even destroyed.

In order to organize the exploitation of reeds, reed-covered areas were divided into six large units (abbreviated as MUS): upstream of Caraorman, Dranov, and downstream of Caraorman, Matita-Merhei, Pardina, and Sireasca-Fortuna.

The reed surface of these MUS (228,000 hectares), which are in turn divided into many natural units (US), represents the entire reed surface of the Delta, part of which is now being exploited.

In the first period (1958-1964) the largest and most easily accessible reed crops are being exploited at: Chilia Veche, Mila 23, Sulina, Crisan, Somova (west of Tulcea), C. A. Rosetti, etc.

The first units for the utilization of reeds were opened at Tulcea, in the immediate neighborhood of the Delta, from where connections with reed-covered areas are quite convenient.

Rumania has two kinds of enterprises for the industrial utilization of reeds: exploitation enterprises (Trust for the Improvement and Utilization of Reeds, abbreviated TAVS, in Tulcea) and such (chemical and physical) preparation enterprises as the reed plants of Tulcea and Braila, the Tulcea Plant of Semichemical Paste and Pasteboard and the Chiscani Plant for Duplex-Triplex Cardboards.

The TAVS (which was called the Enterprise for the Mechanized Exploitation of Reeds before 1959) was created on 1 January 1956. It collects the reeds on a large area of the Delta and distributes them to enterprises for preparation.

During the November 1959 to April 1960 campaign, 100,000 tons of reeds are to be harvested--i.e., three times more than in the previous campaign; 80 percent of the harvesting will be mechanized.

The main organizational centers of reed exploitation in the Delta are Maliuc, Rusca, and Papdia. Within the radius of activity of the Maliuc and Rusca centers, which are hydro-technically equipped, 62 kilometers of canals, 45 kilometers of dams, and 30 hectares of platforms were built to deposit the reeds. At Rusca and Tulcea there are three mechanical repair shops for the tools. Another 83 kilometers of canals, 38 hectares of platforms, and a hangar for seaplanes of the TAVS are being built, and new tools and transport vessels will be acquired.

The Tulcea and Braila Reed Plants, created in 1951, produce reed panels, which are used by many building yards in the country. The Tulcea plant produces about two thirds of the reed panels of Rumania.

The plant for semichemical paste and pasteboard, created in 1950, produces materials for book covers, wrappings, etc., which are distributed to the various poligraphic units of Bucharest and even abroad.

For the complex utilization of reeds, a large combine for the preparation of reeds is being built at Chiscani. The plant for duplex-triplex cardboard was recently opened. The plant for viscose cellulose is rapidly being built. A paper plant, a cellulose-fiber plant and a plant for paper cellulose will be built in 1960. A port is being organized to serve this center. Apartments for the employees of this combine are also being built.

The large combine of Chiscani is built on the basis of mutual assistance based on the convention between Rumania, East Germany, Poland, and Czechoslovakia; this is one example of the brotherly cooperation between socialist countries.

The Utilization of Piscicultural Resources. Approximately half of the Rumanian fish production originates in the Delta.

In order to improve this field, the Danube Delta was initially divided into several piscicultural complexes: Dranov Island (84,000 hectares), Sireasca Sontea (49,120 hectares), Matita-Merhei (36,940 hectares), Pardina (24,500 hectares), etc.

On the basis of the yearly natural production of the soil categories of the Delta, the yearly production was valued at 24,230,000 kilograms, including the Razelm complex; 30 to 40

percent of this production represents fish--i.e., a yearly production of 9 to 12 million kilograms. Sometimes more is obtained.

The main Rumanian piscicultural enterprises are located in the Danube Delta; these include Tulcea, Sulina, and Jurilovea.

In 1957 these enterprises obtained a total production of fish of almost 16,000 tons, of which the majority came from the Tulcea enterprise (over 9,800 tons) (Figure 3).

This production also includes marine fishing (the Sulina piscicultural enterprise).

The piscicultural enterprises have many "cherhanale" (piscicultural points) in the Delta (Figure 4).

Aside from the enterprises which deal with fishing as such, there are enterprises which market fish; these include the Enterprise for Industrialization and Marketing of Fish Products (IIDP) and the "Tulcea" Canned Fish Plant; both are in Tulcea. The products of these enterprises are sold throughout the country and even abroad.

Furthermore, the town of Tulcea is the major piscicultural center of Rumania, in both fish production and specialization in the production of fish.

All piscicultural enterprises are creations of the people's regime; the IIDP, which was created before 1948 and produced little in the past, was rebuilt and equipped after nationalization.

The food industry of the town of Tulcea represents 59.8 percent of the value of total production of the national industry of the town (1958); of this figure, 85 percent of the value of this industry is represented by the fish industry (the town's piscicultural enterprise was included in the food industry). The Tulcea industries produce 17.4 percent (1958) of the total value of the food industry of Constant Regiune.

The Utilization of Forests. The forests of the Danube Delta, consisting mostly of willows and poplars, are administered by the Tulcea Forest District. They are divided into two large forest units (abbreviated as MUF), namely: the northern Celta MUF, between the Chilia and Sulina arms (approximate area, 7,800 hectares); and the southern Delta MUF between Sulina and Razelm (approximate areas, 10,600 hectares).

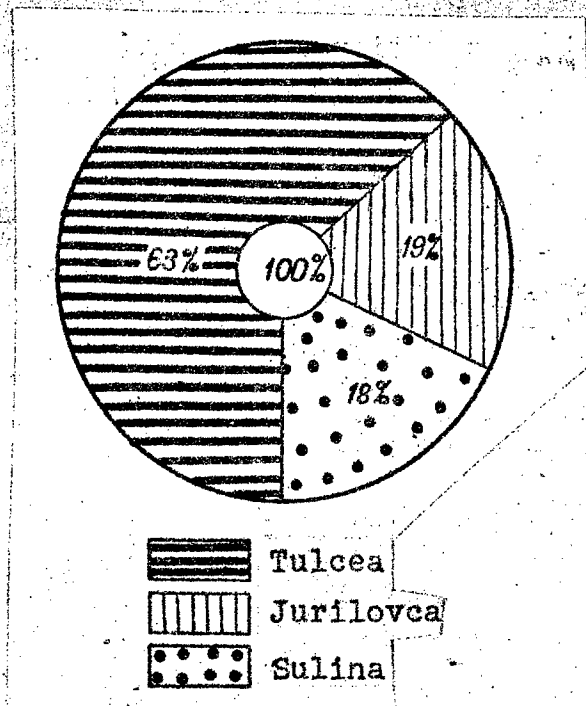


Figure 3. Share of Piscicultural Production of 1957 Obatined by the Tulcea, Jurilovca, and Sulina - Piscicultural Enterprises

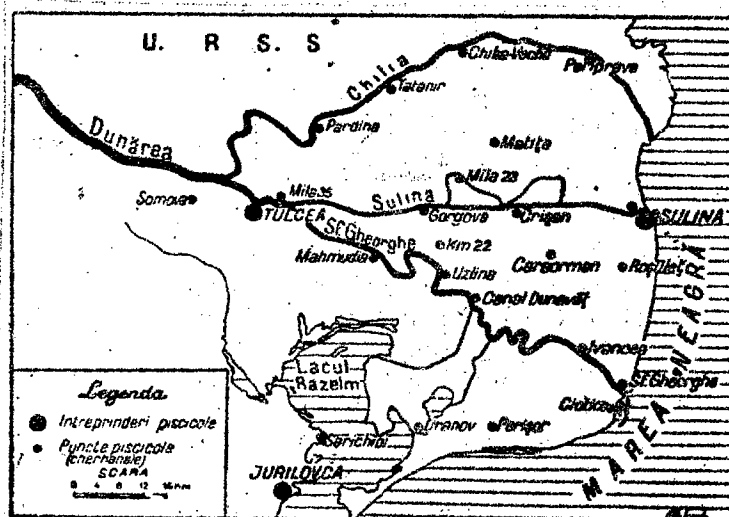


Figure 4. Main Piscicultural Points of the Delta

- = Piscicultural enterprise
- = Piscicultural points (cherhanale)

The people's regime began the industrial utilization of the willows and poplar wood of the Danube Delta, which is used today as a raw material in the manufacture of prestwood panels. Such an enterprise is operating in Braila. A modern section for matches is to be built in 1959 near this enterprise, with an annual capacity of 500 million matchboxes.

The Utilization of Other Natural Resources. Aside from reeds, fish, and forests, the Danube Delta also has other natural resources which are of economic importance.

Sand can be used in construction (the Caraorman bank) and in the cultivation of hybrid vines (hybrids 1001), apples, (guine apple), corn, and rye.

Pastures are used by animal growers. Halophytes are used to fatten cattle and sheep. Rushes, which can produce over 60,000 tons of greens yearly, produce good results when given to animals together with fodder meal. No use has yet been found for the seaweed of the region around Razelm lake.

Game can be profitable in the form of canned hare and wild boar meat for internal consumption and export, or in the form of hides of foxes, "nurca," otter, weasel, and lately "bizams." "Caots," wild ducks, and geese are hunted for consumption.

## Conclusions

In order to raise the economic level of the Danube Delta through the multilateral utilization of natural resources, complex improvements were and are being built by specialists in many fields of activity.

To increase reed production, various experiments are being made as the factories of the large Chiscani combine are being opened; the large-scale mechanical harvesting of reeds was begun in 1959 and 1960.

A more intense exploitation of reeds depends on workers from other regions, and it is therefore necessary to provide living space; apartments, shelters, etc. were built, especially on the banks which border the Sulina canal, in order to be as close as possible to the main reed zones.

It is important to drill in order to supply drinking water to the new reed centers of the Delta. Drilling is undertaken only in the fluvial Delta, because there are large accumulations of sand and gravel below the deltaic deposits; these layers, which are thought to date from the Pleistocene age, contain layers of potable water. Such work is not undertaken in the fluvial-marine Delta (east of the Letea-Caraorman bank), since the water is saline.

New canals were dug to increase fish production by making it possible to use fishing areas integrally. These canals form a water current which retards the growth of certain plants (pond chestnuts, etc.) which are harmful to fishing and even navigation.

Agricultural improvements are also foreseen which would extend arable areas, since only 12,400 hectares of the "dry" Delta are cultivated; 31,500 hectares are occupied by pastures and 300 hectares by vineyards.

In recent years, the Danube Delta has been much visited by Rumanian and foreign tourists. In order to provide housing, shelters for amateur hunters and fishermen were built (Ilgani cabin), and a large hotel is under construction at Tulcea.

All these changes are designed to improve on the of the richest and most beautiful regions of Rumania, which was completely ignored in the past.

In recent years, the appearance of the Delta has changed, and it has become a building yard of socialist construction.

## RUMANIA

### Plans for Light Industry in 1960

[This is a translation of an unsigned article in *Industria Usoara*, Vol 7, No 1, January 1960, Bucharest, pages 2-3; CSO: 3775-N/a]

In the leather-rubber sector, the total production in 1960 will increase by 12 percent compared with 1959. Ten percent more leather shoes, 6 percent more rubber shoes, 13 percent more hides, and 5 percent more soles not made of cowhide will be produced. As a result, the population will receive 2 million more pairs of shoes. Table 1 shows the increases in some of the products in this sector.

Table 1  
Increase in Production During 1959 and 1960 Compared with 1957 with Respect to Certain Products in the Leather-Rubber Sector (in percent)

Type	1957	1959	1960
Leather shoes	100	125	134
Rubber shoes	100	135	140
Hides	100	107	120
PVC-coated textile	100	90	122
PVC linoleum	1	250	500
Synthetic soles	1	350	900

In 1960, plans were made for the introduction of new technological processes, such as the tanning of soles with chromium complexes and with synthetic and vegetable tanning materials, in accordance with a method elaborated by the Institute for the Study of Leather, Rubber, and Glass; the introduction into manufacturing of shoes in two sizes; the application of a new technological process for obtaining flexible soles; the manufacturing of shoes with hot and cold vulcanized rubber soles; the manufacturing of furs from wolf skin, etc.

In order to assure an increase in production in the percentages shown, some enterprises will be reorganized to

produce new products. In some enterprises new rolling bands will be introduced as well as tunnel driers for the drying of skins on glass plates, driers with metallic plates for small skins, etc.

The ready-made sectors will produce 15,000 new models of shoes, 27 new models of furs, 200 small leather articles, and 40 new glove models. Similarly there will be for the first time an industrial production of tablecloths and curtains of polyvinylchloride.

In the fine ceramics sector, the total production will increase by 6.7 percent in 1960 as against 1959; 11 percent more glass will be produced, 2.2 percent more porcelain products, 48.4 percent more enamelware, etc.

Similarly, about 40 percent of the porcelain household items produced will be of first quality, and the percentage of high-quality articles in the fine ceramics sector will be greatly increased.

Particular emphasis will be placed on carrying out small mechanizations with reimbursable funds.

Among the more important operations planned for the sector are: the replacement of fixed furnaces for the firing of decorations at the Glass Factory of Tomesti with a furnace with a rolling belt; the automation of flame-reversing at one of the glass-melting ovens of the Azuga Glass Factory; the extension of mechanization in the feeding of glass-melting ovens in thin and continuous layers.

Among the numerous new products to be produced in the sector, a novelty will be the application of enamel on some bottles with a view to replacing paper labels.

In the household items sector, the total production in 1960 will increase by 9 percent as against 1959. With respect to some products, production will increase as shown in Table 2, with 1957 used as the base year.



Table 2

Increase in Production in 1959 and 1960 Compared  
with 1957 for Some Products in the Household  
Items Sector (in percent)

Type	1957	1959	1960
Chrome-plated table silverware	100	107.57	142.89
Stainless table silverware	100	114.26	148.7
Lithographed household items	100	144.1	169.4
Snaps	100	159	211.8
Razors	100	114	204
Mechanical toys	100	193	240
Celluloid and plastic toys	100	154.1	228.5

For the achievement of these increases, a series of important technical-organizational measures will be taken in the household items sector in 1960. We may give as example the "1 September" factory of Satu Mare, where, through the introduction of an installation for the drying enameled products, a precalculated saving of 226,000 lei will be achieved.

In 1960 various problems will be studied, such as the replacement of lead with aluminum in the manufacture of tubes for pastes, the use of plastics in the manufacture of snaps, the electrochemical sewing of wind [proof] lanterns, the covering of small pieces with celluloid, the bleaching of mother-of-pearl buttons, etc.

In the entire household items sector, over 100 new models of household, travel, and sports items, metallic and plastic toys, ready-made clothing, and small leather articles will be produced in 1960. New types of gas ovens and hot plates, automatic siphons, enameled pots in bright colors, various appliances, etc., will be produced.

\* \* \*

The recent Plenary Meeting of the Central Committee of the Rumanian Workers' Party, like those of November 1958 and July 1959, devoted great attention to the problem of reducing specific consumptions as an important means of saving and of increasing the wealth of the state.

Along these lines, the collective of the "I. Herbak" works of Cluj started a competition at the end of 1959: "For each product, the lowest specific consumption and the best quality." On this basis, in 11 months enough upper and sole leather was saved to make 65,000 pairs of shoe uppers and soles for 34,000 pairs of shoes.

The competition initiated by the collective of the "I. Herbak" works of Cluj was adopted by the majority of the collectives in the shoeleather industry as well as in other sectors of light industry, thus bringing important savings.

As was shown at the Plenary Meeting, these savings enabled our state to reduce the import of skins in 1959 by 3,600 tons as compared with 1958, and in 1960 it will be possible to reduce this import by a further 3,100 tons, even though the production of shoes will increase.

## RUMANIA

### Tanning of Soles

[This is a translation of excerpts from an article by Mircea Popescu in Industria Usoara, Vol 7, No 1, January 1960, Bucharest, pages 4-7; CSO: 3775-N/b]

In 1948 there were about 50 small units engaged in vegetable tanning. At present, through the dissolution of the small shops which were incompatible with modern techniques, the amalgamation of small units, and the constructive and technological systematization of the units, the number was reduced to 16 vegetable tanning units with a capacity 1.6 times as large.

\* \* \*

At present the following technological processes are applied in the tanning of soles in Rumania:

The method of tanning with tannin and mixed chromium-aluminum salts, applied in a 70 percent proportion at the "Ianos Herbak," "Kirov," "Flacara Rosie," "Nicolae Balcescu," and "Timpuri Noi" enterprises, represented 32 percent of the butt sole production of the entire sector in 1957 and 45 percent in 1958.

The method of tanning with formol and tannin, used at the "Partizanul" and "Straduinta" enterprises, represented 10 percent of the production of the sector.

The method of semi-slow vegetable tanning applied at the other enterprises, represented 68 percent of the production of the sector in 1957 and 45 percent in 1958.

The manufacturing cycle was the first criterion guiding the evolution of the technology for the tanning of soles in Rumania.

At the time of nationalization, the slow tanning process, with an average cycle of 90 days, was used in our industry.

The need for increasing the productive capacity led to the reduction of the manufacturing cycle in the sector. At first this was done simply by eliminating the pre-salting and by shortening the flotation time, without taking into account that this would mean giving up some very important characteristics resulting from the slow tanning of soles: low specific weight, low content of soluble substances, and especially better resistance in use.

The problem of reducing the manufacturing cycle began to be treated in a more sophisticated manner and in correlation with the other criteria from 1951 on, through formol-tannin tanning and especially in 1954 through chromium-aluminum-tannin tanning.

At present the manufacturing cycle in our country is average as compared with that of other countries:

Semi-slow tanning has a total cycle of 51 to 60 days, of which 37 to 46 days are used for actual tanning.

Chromium-aluminum-tannin tanning has a cycle of 47 to 60 days, of which 33 to 46 days are used for actual tanning.

Formol-tannin tanning has a cycle of 41 to 43 days, of which 27 to 29 days are used for actual tanning.

\* \* \*

Resistance to wear is best in the case of soles produced according to the systems which have solved the problem of the manufacturing cycle in correlation with the other criteria. The average data of this index determined by the Grasselli apparatus shows the following values:

<u>Type of Soles</u>	<u>Percent Wear After 100 Rotation</u>
Semi-slow tanned	11.5
Formol-tannin tanned	10.7
Chromium-aluminum-tannin tanned	8.5

Moreover, this criterion was, until now, decisive for the orientation along the lines of extending the chromium-aluminum-tannin system.

Another problem posed for the sole-tanning technology of our country was that of reducing the proportion of imported tanning materials. By the construction in 1950 of the new factory for tanning extracts at Pitesti, the resources of indigenous tannin have increased considerably. However, owing to the fact that the vegetable tanning materials specific for our climate have only mediocre tanning properties and that the technology of the industry producing tanning materials has some deficiencies which have accentuated this mediocrity, the replacement of imported tanning agents with indigenous ones required considerable technological effort on the part of the tanning sector.

The positive result of this effort is revealed by the reduction in the proportion of imported tanning agents from 73 percent in 1950 to 68 percent in 1955 and 32 percent at present.

As far as the use of synthetic tanning agents is concerned, our industry showed a serious lag behind other countries until 1957.

Beginning in that year, the organization of the manufacturing technology of Rumanian synthetic tanning agents of the Romatan type, and the construction of some sections and a factory for synthetic tanning agents, caused the percentage of synthetic tanning agents used in the tanning sector to rise to 5 percent in 1958 and 17 percent in 1959.

This worthy achievement brings our country closer to the achievements of other countries with similar conditions regarding tannin resources, which use synthetic tanning agents in the following proportions: Poland, 20 percent; Czechoslovakia, 25 percent; USSR, 30 percent; Hungary, 40 percent; and East Germany, 50 percent.

In the light of the above remarks with respect to the corroding effect of synthetic agents on collagon, the order of compatibility with increased proportions of synthetics in the technological processes practiced by us is as follows: chromium-aluminum-tannin system, formol-tannin system, and semi-slow system.

With respect to the production of soles of varied flexibility specific for each manufacturing system, one must cite the studies made at the "Ianos Herbak" enterprise as well as the industrial achievements of the "Dobrogeanu Gherea" enter-

prise in the manufacture of soles with characteristics suitable to the specific manufacturing system.

The technological flexibility required for the production of soles with different characteristics decreases from the semi-slow to the chromium-aluminum-tannin system, which remains a system specific for long-wearing shoe soles that require no special flexibility.

The last two criteria--the obtaining of an increased yield of surface area and the recuperation of hair--cannot serve as bases for an analysis of the technological processes practiced by us, because from this point of view there is no difference between them.

Where conditions permitted technological or constructive solutions, hair is recuperated by the static method with a low concentration of  $\text{Na}_2\text{S}$  at the "Partizanul" factory and at the systematization unit of the "Flacara Rosie," and by the barrel method with calcium polysulfide at the "Nicolae Balcescu," "Kirov," and "Bucovat" plants.

\* \* \*

The analysis made shows that of the technological processes for the tanning of soles practiced at present in our country, the chromium-aluminum-tannin system corresponds best to the criteria established before as the determinant ones for this problem. Indeed, it occupies first place with respect to resistance to wear and compatibility with increased proportions of synthetic tanning agents, and it is at a comparative level corresponding to the manufacturing cycle.

## RUMANIA

### Investments to Develop the Silicates Industry

[This is a translation of an article by Stefan Cremene in Constructorul, 6 February 1960, Bucharest, page 2; CSO: 3788-N/a]

The importance of the development of the cement and glass industry was emphasized by the Plenary Meeting of the Central Committee of the Rumanian Workers' Party of 3 to 5 December 1959. Exemplifying the most important of these objectives, the theses outline four main objectives: the development of the Cement Factories in Bicaz and Turda and the Glass Factory in Scaeni, and the increased development in 1960 of the Cement Factory in Fieni in order to place it into operation earlier.

The productive capacity of the Cement Factory in Bicaz will increase by 350,000 tons of cement annually, beginning in the first quarter of 1961; beginning in the second quarter of 1961 the capacity of the Turda Cement Factory will increase by 600,000 tons of cement annually. The Fieni Cement Factory will increase its production by 300,000 tons of cement, and the Scaeni Glass Factory will produce 3,600,000 square meters more of reinforced glass, beginning in the first quarter of 1961.

For the achievement of these objectives alone, the state plan foresees an investment fund of 122,000,000 lei for 1960. For the development of the silicates industry in general and the raw material base for cement, lime, gypsum, and glass, the funds allocated for the realization of the 1960 investment plan are 530 percent larger than in 1959, emphasizing the importance given to the rapid development of this industrial sector by the Party and government and showing the particularly important tasks faced primarily by the Directorate of the Silicates Industry in order to assure the fulfillment and even surpass the provisions of the state plan.

The year 1960 represents a turning point for the silicates industry, not only with respect to the rapid quantitative development of the productive capacity but also qualitatively with respect to its development and equipment with modern

technical means for higher productivity that will ensure a superior technical control of the technological processes of production and for an ever greater application of the new technology.

The projects relating to the development of the cement factories have shown the daring adoption of technological methods with technical-economic indices at the most advanced technical level. Thus the clinker furnaces will have a production of 800 tons per 24-hour period, with a fuel consumption of 1,450 kilocalories per kilogram of clinker, as against the about 300 tons of production per 24-hour period with a fuel consumption of about 1,850 kilocalories per kilogram of clinker at the existing "23 August" furnaces. Under these conditions, the cost price of the cement in the factories to be developed could be reduced by 18 to 20 percent. The specific investments for the new lines will vary between 290 and 320 lei per ton of cement as against the specific investments of 680 to 730 lei per ton of cement in the relatively new cement factories of Bicaz and Medgidia. The profitability of the developed cement factories will increase from 7 percent to about 25 percent, reducing the period for the recuperation of investments to 2.4 to 2.8 years.

With a view to obtaining superior indices in the glass factory as well, a furnace was provided for the Scaeni Glass Factory which has nine machines for drawing glass and a production of 6,100,000 square meters of glass per year (as against the plan provisions for only 3,600,000 square meters per year), a daily melting index of 800 kilograms per square meters as against the existing 600 kilograms per square meter, and a glass drawing speed of 120 centimeters per minute as against the 110 centimeters per minute planned for the last technological line made.

The development of our machine-building industry allows the manufacture in Rumania of high-capacity equipment which will ensure production, productivity, and other economic indices characterizing the new cement and glass technological lines to be obtained in 1960-1961.

At the same time, in order to supply the increased needs for interchangeable parts, especially for the cement industry, and to improve the quality of these parts, the 1960 investment plan provides significant funds for a corresponding equipment in the "9 May" Plants.



For the silicates industry 1960 must also represent a turning point with respect to the beginning of industrial production of an ever larger number of new and efficient construction materials. From the experimental and semi-industrial production phases which have characterized the activity in this field in 1959, the finalization of the technological process must be obtained to assure reasonable costs of construction and the realization of industrial lines for sponge glass, glass panels, glass thermopanes, reinforced undulated glass, colored glass, high-resistance gypsum, and other products. The increase in the 1960 investment fund calls for decisive measures in order to achieve this volume and so that the invested funds will more rapidly give concrete results. In the first place, it is necessary to ensure an intensification of planning. The IPCMC [not identified] must, with the aid of the Directorate of New Technology, find ways to reduce the planning time and to elaborate some high-quality projects aiming persistently at a continuous reduction of monetary costs. These reductions must be made especially by lowering the volume of construction operations.

Sometimes areas were planned or even constructed which were exaggerated with reference to the requirements of the technological process, and sometimes uneconomical construction systems were used. For a straw warehouse built by the Glass Factory in Medias, a difficult solution employing frames and monolithic reinforced concrete plates was used; in the planning of the Cheia Gypsum Quarry in Turda, a two-lane reinforced concrete bridge over the Ardes River was suggested for the occasional passage of trucks, etc.

There is a waste of unproductive spaces. Thus, the Directorate of the Silicates Industry received a plan relating to the development of the Scaeni Glass Factory, where, for reasons of relative esthetics and symmetry, a two-level new laboratory was planned, the ground floor not having any particular designated use, and a new administration building was included, even though the present one could adequately supply the needs of the new factory.

The IPCMC's planning activity must not lose sight of the fact that "not the buildings but the equipment represent the essential element in production." Another problem of particular importance related to planning is that of assuring the receipt of the equipment plans in time from the sub-designers. A positive factor in this respect is the fact that the IPCMC, as the general planner, transmitted the respective orders and design subjects to the sub-designers.

It is necessary that the IPCMC and the IAUPS [not identified] maintain a close relation with the equipment planners in order to assure the delivery in time of the necessary plans.

In order to shorten the time required for the approval of documentation (which in the past sometimes took as long as it did to carry out the respective documentation), it is necessary that the IPCMC assure the obtaining of the legal approval while the plans are being prepared and see that the beneficiaries have the necessary elements for obtaining local approval, which they are responsible for, as early as possible.

In this manner, together with the respective planning phase, it would be possible to submit the approval for fuel, electric power, incorporation, and systematization, and specific permits for the plan (MTT [not identified], Water Committee, etc.). Also during the course of planning, the necessary documents for expropriations should be submitted, as the approval of these requires a longer period.

It is also necessary to reduce to the minimum the time required by the CTS, the CSP, the CSCAS [abbreviations not identified], and in accordance with the latest provisions of the Investment Bank, as well as for the introduction in the plan of new projects through decisions of the Council of Ministers. This may be achieved in two ways: on the one hand, by steps being taken by the PICMC and the DPM [not identified] to ensure the elaboration of complete documentation, judiciously grounded from a technical-economic point of view, which will give greater efficiency in the work of the approving authorities, and on the other hand by the elimination of all kinds of formalism.

Once a new work is introduced into the plan, it is the task of the builder to carry it out.

With few exceptions (for instance, the Cement Factory in Bicz), the experience of 1959--when the investments foreseen in the plan of the Directorate of the Silicates Industry were achieved almost completely and placed into operation by our construction trusts--allows us to believe that even this year the builders will successfully fulfill their important tasks.

The Construction Trusts No 1, No 5, and No 21 must take thorough organizational measures to ensure the necessary labor force corresponding to the new volume of work for the silicates industry, which is approximately five times larger than in 1959. Thus the yards for "increasing the capacity for grinding cement"

must immediately be opened, increasing the capacity for cement grinding at the "Socialist Victory" Cement Factory in Turda (Trust No 5), the "Blejoi" colored glass section of the Scaeni Glass Factory (Trust No 1), the installation of a paste mill at the "Ilie Pintilie" Cement Factory in Fieni (Trust No 1). In February, organizational work must be started for "the installation of a cement mill and a 'zgura' drier" at the "Temelia" Cement Factory in Orasul Stalin (Trust No 5), as well as for the development of the cement factories in Fieni (Trust No 1) and Turda (Trust No 5); and in the beginning of March of this year, the development of the lime factory and quarry at the Bicaz Cement Factory (Trust No 5) must begin.

The Directorate of the Silicates Industry, as the beneficiary of the investments, has the entire task of coordination, with respect to both the obtaining and approval in time of suitable documentation as well as with respect to the synchronization of the procurement of equipment during the course of the construction work. The realization of such a volume of investments, which at the same time must constitute a qualitative leap forward in the realization of advanced technology, requires particular effort on the part of the small apparatuses of the Directorate and on the part of the collectives from the factories benefiting from the investments.

This effort is made even more necessary by the fact that the realization of the 1960 investments occurs under conditions of continually increasing demands by the approving financing and controlling authorities, which also aim, in the spirit of the latest Party and government decisions, at an increasingly efficient use of investments.

## RUMANIA

### Economic Briefs

The 1960 plan of the construction materials industry foresees important increases compared to the 1959 achievements. In the case of cement, the production increase is 195,500 tons; glass, 4,250,000 square meters; bricks and ceramic tiles, 8,050,000 units; tarpaper, 18,375,000 square meters; and lime, 30,000 tons. The cost price will have to be reduced by 3.2 percent, and the benefits target foresees an increase of 75 percent as against the benefits planned for 1959. Similarly, an increase of 5 percent in the productivity of labor is foreseen.

The cement factories will produce the clinker required for the additional cement plant for 1960 with the existing equipment and without any supplementary investments. Owing to the improvement in technology, the technical-economic indices of the clinker furnaces at the Bicaz Cement Factory increased from 15.76 in the second quarter of 1958 to 18.27 in the second quarter of 1959. There are still factories where the technical-economic indices are unsuitable. The "Ideal" Cement Factory in Cernavoda obtained indices of 15.69 during the second quarter of 1959 as against the 16.10 achieved during the second quarter of 1958.

At the "19th Congress" Cement Factory, a reduction in the percentage of water in the paste brought about a consumption of 176.3 kilograms of crude oil in the third quarter of 1959 as against 190 kilograms per ton of clinker in 1958. At the "Cement of Peace" Factory, the electric power consumption was reduced by the installation of phase compensators and meters on the equipment, as well as by using the furnaces and mills at their maximum capacity. Thus, against the 82.6 kilowatt hours per ton of cement obtained in 1958, the consumption in September 1959 was reduced to 78.8 kilowatt hours per ton.

Through the production of bricks with 31 holes at the "Hercules" factory in Tirnaveni, a raw material consumption 21 percent smaller than that for normal bricks was obtained. This also led to a reduction in the other consumption indices because the drying as well as the burning cycles are shortened.

A particularly important contribution to a substantial reduction in the cost of the production of ceramics was made by the brick factory in Satu Mare, which began firing ceramic products with waste wood. By the adoption of this innovation on the part of the ceramic products factories of P. Neamt, Urziceni, Feldiara, Jimbolia, and Jugoij, production costs were reduced by about 2.5 million lei.

This, together with an increase in the utilization indices of the equipment and a considerable reduction in the number of rejects--which is an important means of lowering costs, contributed to the achievement of some outstanding results. The Roman Brick Factory reported 343.20 lei per thousand bricks during the first quarter of 1959, compared with 420.02 in 1958. The "Zorile Noi Factory obtained 1,000 solid bricks for 338.72 lei compared with 402.92 lei in 1958, and in the case of hollow bricks, 373.21 lei as against 500 lei planned for 1959.

Another principal element in the cost price which must be followed carefully is the wage fund expenditure, which is in terms of the productivity level of the enterprise. The problem holds for all the enterprises within the DGIMC [not identified], and in particular for the ceramic factories where wages are very important, sometimes accounting for up to 38 percent [of the production cost].

(Constructorul, 6 February 1960, Bucharest, pages 1-2;  
CSO: 3788-N/b)

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#### The Development of the "Gh. Gheorghiu-Dej" Clothing Factory

At the end of last year, Construction Trust No 1 began expansion work on the "Gh. Gheorghiu-Dej" Clothing Factory in Bucharest on the basis of the plan prepared by the IPIBC [not identified]. This entails the construction of a new finishing hall for the finishing of cotton and wool knits, stockings, etc. The hall will be supplied with modern equipment for dying, bleaching, and drying; the technological finishing process will be mechanized and automated. A second important objective is the large-capacity central heating station, which will supply steam for neighboring industrial units as well, namely for the "Klement Gottwald" Plant and the new combine for dairy products. For the satisfaction of the entire

industrial and drinking water needs of the factory, two deep wells are being drilled and will be placed into operation at the end of this quarter.

At the thermal power station, the concrete foundation has already been poured, as has 60 percent of the elevation. A considerable portion of the external walls are already erected. Receipt of the documentation from the beneficiary is awaited for starting the finishing hall.

(Constructorul, 6 February 1960, Bucharest, page 3; CSO:  
3788-N/b)

- END -

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